

The Mining Journal

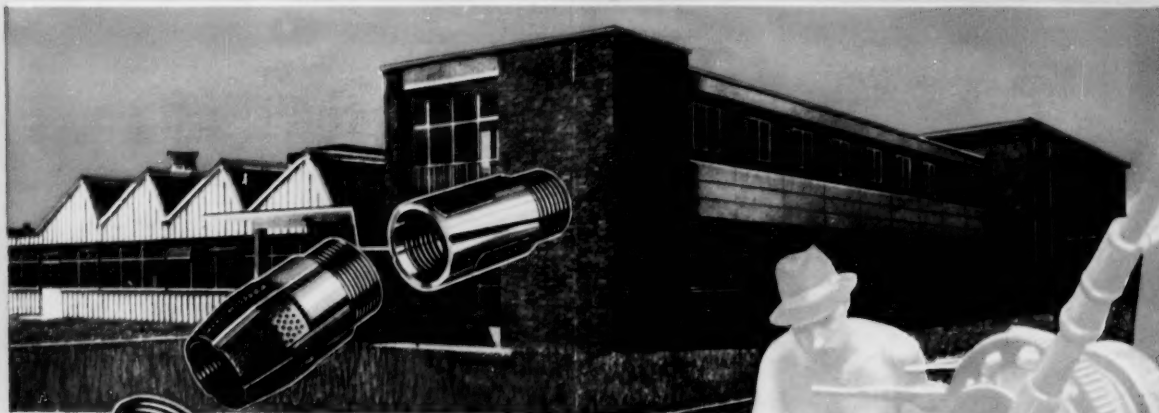
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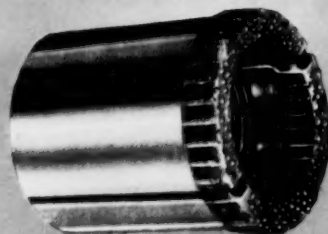
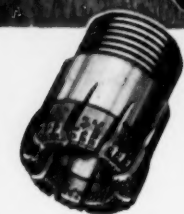


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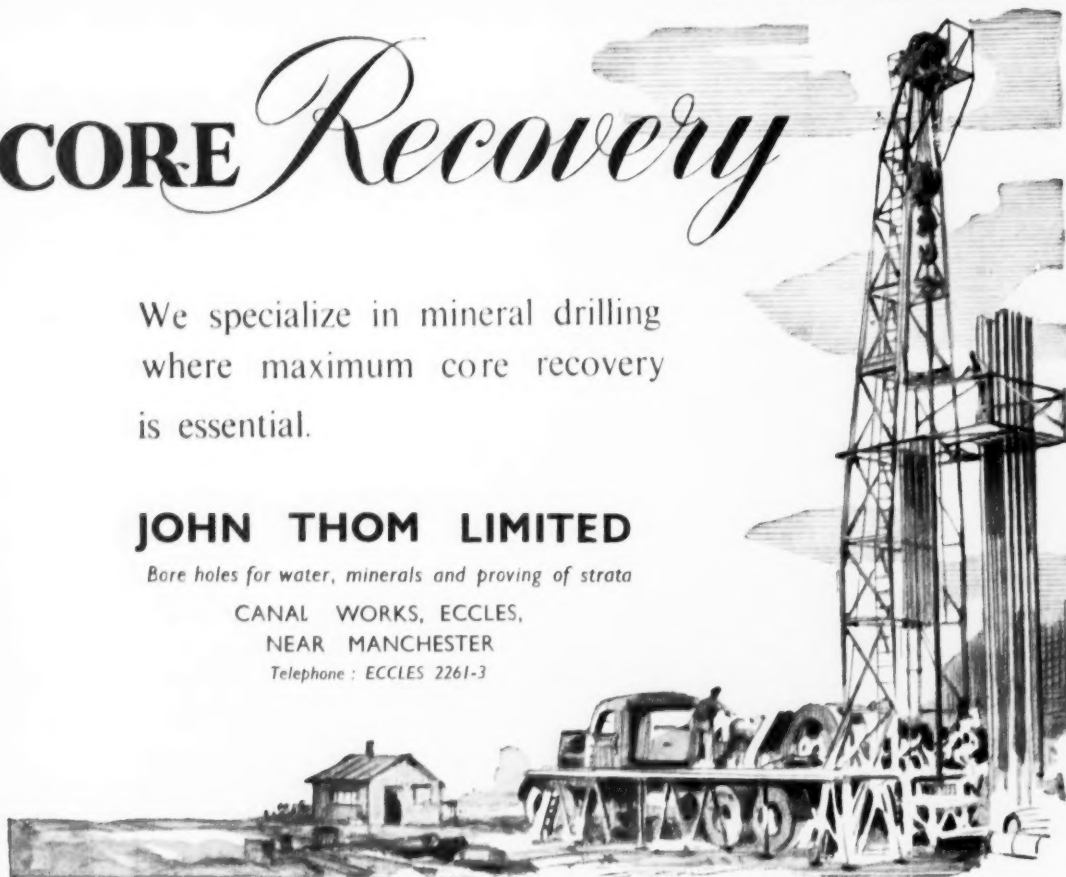
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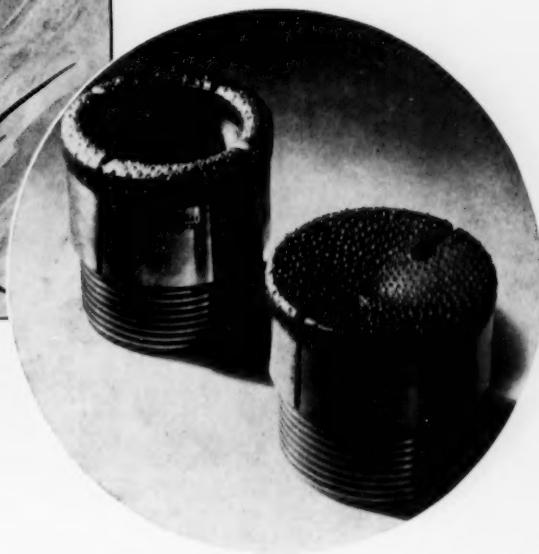
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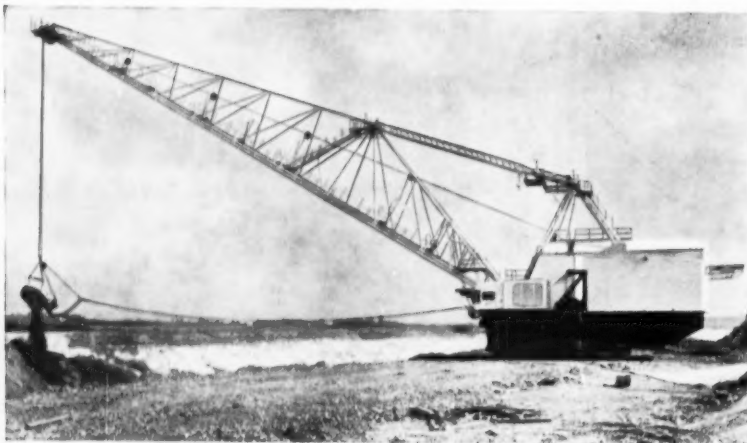
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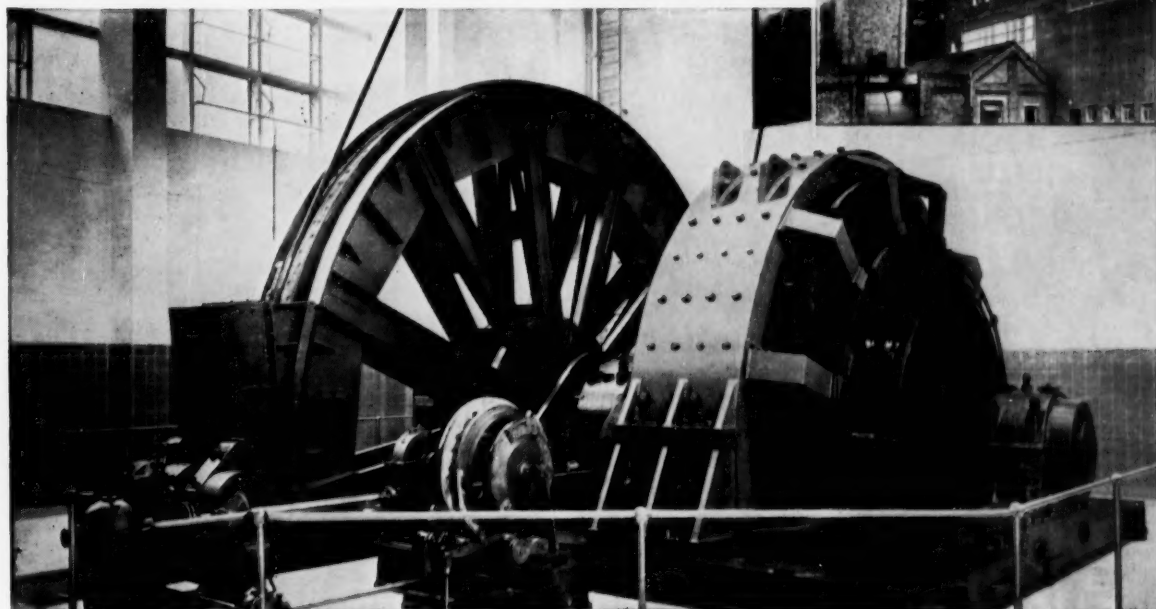
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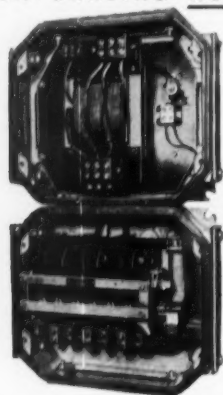
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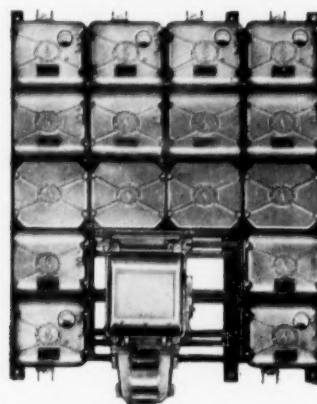
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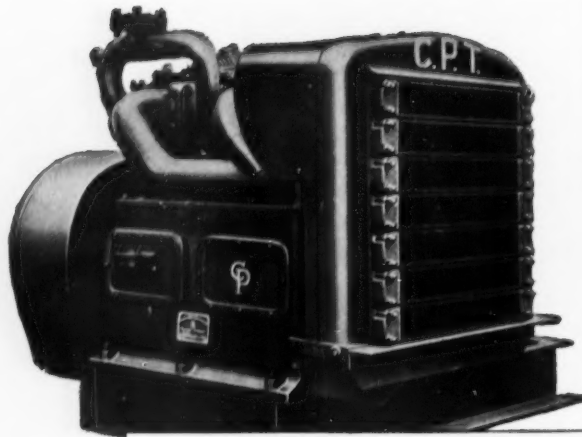


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The Mining Journal

Established 1835

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NOTES AND COMMENTS

Too Much Money for Too Little Work

The National Coal Board recently announced its largest quarterly deficit since the mines were nationalized in 1947. After allowing for payment of £5,150,000 interest to the Minister of Fuel and Power the estimated loss for April, May and June amounted to the staggering total of £19,200,000. Included in this figure is a loss of £6,700,000 on imported coal, but even discounting this loss and interest the mines were still in the red to the tune of almost 3s. 1d. per ton. The figures published show an amazing variation of profitability ranging from a profit of 5s. 8d. per ton in Nottingham to a loss of 40s. 4d. per ton in Somerset. The accumulated deficit since vesting date has now reached £41,180,000.

Alarmed by the falling output the N.C.B. and the National Union of Mineworkers have agreed to a joint pit by pit investigation of the reasons for the decline. The N.U.M. Executive have admitted that there is a marked difference between actual output and potential output with the present labour force, and accordingly a six man team has begun an investigation into the reasons for the unsatisfactory performance of the U.K. coal industry. The team includes three members of the National Coal Board and three from the National Union of Mineworkers Executive. It is significant that the first area to be investigated was the anthracite area of South Wales—always a black spot so far as restrictive practices are concerned.

The investigating committee came into being largely as a result of the unfavourable reception by the colliery lodges of the Board's proposal to import 10,000 Italian miners to augment Britain's dwindling labour force. Whilst the executive realized the need for imported labour and agreed in principle with the Board's plan they were under no delusions as to the reception the scheme would have in the coal fields. Thus the Union leaders were placed in a dilemma. They were afraid of the reactions of public opinion if they turned down the Board's plan and yet were more afraid of loss of face if they accepted the plan and it be turned down by the lodges. Consequently, they played for time and asked for this probe in order to discover whether or not the existing labour force was being utilized to its fullest extent.

It is difficult to see just what good will come of the

investigation in view of the issues involved. No doubt managerial heads will roll—but to what effect? The problem still remains. Too much money for too little work.

There is no doubt that the Italian miners are needed in Britain's coal fields, for at the present time there are 4,300 fewer mineworkers than a year ago. The labour shortage is more or less restricted to three main areas—Yorkshire (4,000 men needed), the West Midlands (6,000 men needed) and South Wales (5,000 men needed). The first two areas are economically productive but, unfortunately, the existing national wage structure precludes raising wages in these areas as an inducement to men to come into them.

To offset the dwindling labour force the Coal Board is continuing the drive towards increased mechanization, and latest figures show that 430 power loading machines are now at work underground. There is still, however, a long way to go before power loading can have a truly significant effect on output.

The First Step to Solving a Problem is to Recognize that it Exists

When discussing in our last issue the need for a British mineral resources policy, we referred to the prospect of increasing American demands upon the mineral output of the rest of the world as well as to the tremendous potential growth in non-American consumption. We also drew attention to the defective state of our sources of world statistical data, more particularly with reference to consumption figures. As it happens news reaches us this week of recent authoritative pronouncements in the United States which serve to re-emphasize the much greater recognition which these problems have long been receiving over there.

Thus, we have Mr. Douglas McKay, Secretary of the Interior, telling the annual convention of the American Mining Congress about the expanding activities of the Bureau of Mines in its search for better mining and metallurgical methods, with particular reference to the working of low grade deposits. Mr. McKay clearly accepts the U.S.A.'s growing dependence on imports as an inescapable fact around which the Administration is shaping a deliberate policy. "No longer," he says "can we fight a war or sustain an industrial economy without the aid of materials

from foreign sources. The United States is heavily dependent on imports of tin, chromium, nickel, manganese and bauxite. To-day we are also on an import basis for petroleum, copper and other mineral commodities whereas not so long ago the U.S. was a net exporter of these products." (The Paley Report estimated that out of more than 100 minerals employed in American industry, the U.S. was, to a greater or less extent, dependent on imports in respect of nearly 70 per cent of them.) Mr. McKay goes on to make it clear that the Administration's policy will be to keep American markets open to foreign producers, while encouraging the building and maintenance of an economically sound domestic mining industry employing such financial incentives and import controls as may be required to accomplish this objective. With this in view, continuing appraisal of the United States' mineral resources will be one of the principal tasks of the Bureau of Mines.

In practical terms these policies are well illustrated by the Administration's attitude to the main base metals. Thus, tin production, for which metal the States is wholly dependent on imports, is supported, at an economic but by not excessive price, through heavy stockpile buying. Copper, of which the States is a heavy importer, also carries no import duty, while the domestic production is being stimulated by floor price contracts for a number of low grade projects which would certainly have been sub-marginal at between a 24 and 30 c. price level and may well become so again when prices return to more normal levels. In the case of lead and zinc, of which the States is also a substantial importer, the position is somewhat different in that the weight of world offerings has tended to depress prices below the level at which the domestic industry as a whole can operate economically. Consequently, we find a retention, but not an increase, of import duties coupled with a domestic stockpiling programme designed to put a floor under prices which will keep the domestic mines in production. For a whole range of other strategic materials the U.S. has for some years had stockpiling programmes at virtually whatever price was necessary to ensure adequate deliveries.

We recapitulate these well known facts only to emphasize that despite its apparent inconsistencies the U.S. Administration has at least got a positive approach to its minerals supply problem, backed by the statistical and research facilities of the U.S. Bureau of Mines which, whatever its shortcomings, is in a position to supply the Administration with far more accurate and complete data on which to base its policies than is the case in any other country.

Again, on the subject of potential mineral demand outside the U.S., we have Mr. Jean Vuillequez, vice-president of the American Metal Company, pointing out at a recent meeting of the National Industrial Conference Board in New York, that last year the U.S. used a combined total of about 60 lb. of copper, lead, zinc and aluminium, *per capita*, compared with an average consumption of 5.6 lb. throughout the rest of the world. In other words, the United States is at present using over ten times as much of these metals *per capita* as the rest of the world. This ratio illustrates very clearly the vast potential growth which must be expected in mineral requirements outside of the States as living standards advance, more or less rapidly, in various parts of the world. Thus, when this prospective demand is added to the growing American competition for the rest of the world's mineral output, we begin to get some idea of the magnitude of the supply problem ahead of the mining industry.

It is already apparent that this problem is sooner or later going to force many countries into the necessity of artificially stimulating the production of some minerals, of finding substitutes and methods of conservation to eke out supplies of others, and, to a greater or lesser extent, of

controlling the destination of minerals in short supply in accordance with the conflicting requirements of their domestic industries and their balance of payments position. Moreover, in the case of the sterling area, it is, as we showed last week, a problem which must essentially be viewed from the standpoint of the Commonwealth as a whole, and as such is demonstrably far more complex than that with which the United States is already grappling.

Whether we consider the matter on a British or a Commonwealth basis, it is obvious that the extensive statistical and technical data, on which this kind of problem has to be decided, is not at present available at any one time in any one place. Mr. Vuillequez might well have been speaking for the Commonwealth when he remarked to the National Industrial Conference Board that there was a crying need for international co-operation so that government and the business world might have access to up-to-date accurate data and market forecasts. Neither producer nor consumers, he pointed out, can plan intelligently if they are ignorant due to lack of statistical data. In his opinion one of the important tasks of the United Nations should be to make available such statistical data and forecasts in *comparable units*.

The past 15 years have witnessed two *ad hoc* attempts at the international co-ordination of mineral supply and demand—the combined Raw Materials Board in Washington during World War II and the International Materials Committee which operated (also from Washington) in the period of extreme shortage following the post-Korean boom. There is thus ample evidence of the need for such co-ordination in a crisis. It may well be that we are now entering a period of more or less chronic supply shortages, in which case some form of permanent international organization may eventually be forced upon us. Whether or not this proves to be the case, it is clear that the Commonwealth, no less than Britain, must remain at a considerable disadvantage in meeting what in any event seems certain to be a changing situation, unless Britain is herself equipped to formulate and give effect to a coherent and continuing minerals policy. For this, the first prerequisite is close and cordial relations between government and the industries concerned, the second is adequate machinery for ascertaining and correlating the facts upon which a policy may be based.

Titanium and Vanadium from New Zealand Iron Sands

Hitherto found to be unusable in blast furnaces because of the presence of titanium, the vast deposits of iron sands stretching from Patea to the Waikato in New Zealand which are estimated to contain 700,000,000 tons or more of recoverable iron, may become the basis of a large new industry as a result of experiments that are taking place at the Victoria University College.

It is now hoped that the titanium in the iron sands, which previously prevented their use, might now be the premium material which would render processing economical since when purified by such possible ore dressing processes as fine grading and magnetic separation, the deposits are found to contain 0.3 per cent of vanadium and 8 per cent of titanium.

To carry out investigations into possible treatments which might make the iron sands of economic value, an intricate electrical furnace, capable of achieving temperatures of the order of 2,000 deg. C., has been built at Victoria University College. A statement recently issued by Mr. W. R. B. Martin and Professor A. D. Munro, of the College chemistry department, said that it was believed that electrothermal processes offered more chances of success than blast furnaces in the search for greater knowledge of the properties of the titanium-bearing slag from

the sands. By using an electric furnace the passage of air through the furnace is eliminated and it has been found that if iron ore containing titanium is fed into an electric furnace and suitable fluxes are added, the titanium is incorporated into the slag and flows from the furnace. Because nitrogen from the air is excluded from the electric furnace the material that accumulates in the blast furnace cannot form.

Mr. Martin has said that, on that basis of present knowledge, these furnaces could make satisfactory iron and it was possible to work out fluxes that would carry the titanium out in the slag without trouble. This had been demonstrated by Norwegian experts at Onkaka in the Nelson district, who used iron sands from Patea beach in a series of trials. The high cost of electric power in this region, however, has rendered the process uneconomic.

Investigations at the Victoria University College have shown that the bulk of the deposits are almost identical and that they form an iron ore reserve greater than that in Australia. The College is conducting experiments on the extraction of vanadium directly from the ore, and already considerable percentages are said to be recoverable by use of a simple process.

Those sands with the highest titanium content occur north of Waikato and on the West Coast of the South Island, and these are considered to be of much interest as sources of titanium, either as titanium dioxide paint or as metal. Experiments—mainly on the line of improved laboratory ore separations—are proceeding on these sands and already higher percentages of titanium recovery are being reported.

Australia

(From Our Own Correspondent)

Melbourne, September 30.

Fear of approaching inflation is causing uneasiness in the Australian mining industry, particularly in gold mining. With the present prices for base metals, particularly copper, there is a considerable margin between costs and market prices before a dangerous position is reached. With the fixed price for gold, and that price very close to the borderline, the outlook is gloomy if any appreciable rise in costs results from the present upward trend in wages and stores.

DISTORTION IN WAGE DIFFERENTIALS

The inflationary trend can be attributed directly to labour, commencing soon after the end of the war by the granting of an increase of 20s. per week in the basic wage and by the establishment of a 40-hour week, which is regarded as the most serious blow ever inflicted upon Australian industry. During the regime of the present Government, in its efforts to check rising inflation, the Federal Arbitration Court suspended the quarterly adjustment of the basic wage. The immediate effect upon costs was salutary, and industry hoped for a period of stability, but certain State labour governments legislated for the continuance of quarterly adjustments within their sphere, thereby seriously discounting the benefit of the Federal action.

Unfortunately, in wage adjustments, attention has been given in very disproportionate degree to the basic wage earner compared with the skilled worker. Hence the demand has arisen for adjustment of the margins for skill, followed by strikes caused by dissatisfaction over the

margins granted in numerous cases. The steep general upsurge in the wages bill, as the result of increases in margins, is a real danger to all industry. Mining is not so directly affected, but will be hit more indirectly through the increased cost of stores and services, and the inevitable rise in the cost of living and its effect upon the basic wage.

Added to all that has gone before, the increased margins are an inflationary threat. Moreover, Victorian mining is faced with a large increase in premiums for Workers' Accident Insurance. To June, 1953, the premium for underground workers was 143s. per cent; this has now been increased to 400s. per cent, covering accident, industrial diseases, and claims under Common Law. This increase can well be prohibitive. Compensation payable to employees is £A12 per week, and the cost of insurance per employee in £ per year can be compared over three years; 1953, £21; 1954, £55 and 1955, £200. These heavy increases in premium will be contested by the industry.

GOLD MINING AT ITS PEAK

Gold mining appears to have reached its peak under present conditions. Western Australia, which produces 79.7 per cent of the country's total, has maintained a position very close to that of the previous year, output for the eight months to August 31 being 560,344 f.oz., compared with 567,370 f.oz. In the same period of 1954 Victoria's gold production for the eight months to August 31 decreased by 30 per cent to 27,422 f.oz., the August output being 3,358 oz. Gold mining is at a very low level in this State.

The inflationary trend will make the existing position of gold mining still worse, and if such adverse development takes place, gold mining will require a substantial subsidy, which will have to approximate £5 per oz. to give stability to the industry.

ALUMINIUM PRODUCTION

The plant of the Australian Aluminium Commission at Bell Bay, Tasmania, has been officially opened. The cost of the works is £A12,500,000, including housing for employees. A total of 600 men will be employed. The Commission hopes to produce 6,000 tons of aluminium this year, 10,000 tons next year, and by 1960 it is hoped to reach full capacity of 13,000 tons per year, which will be about 75 per cent of the country's requirements.

Ore will be largely imported; about 52,000 tons of bauxite from Malaya. This material is of higher grade than Australian ores, which have a high silica content, but the plant has been designed to process such low grade ores in case of emergency. Their treatment at present would be uneconomical. Other imported materials will be petroleum coke from U.S.A., British pitch and cryolite from Greenland. The selection of a site in Tasmania was influenced by the capacity of that State to supply cheap hydro-electric power.

LAND GRANTS FOR MINING

The Western Australian Government has introduced legislation to enable the granting of rights over an area of 3,000 sq. miles for the search for nickel, close to the South Australian border.

Early in the year, the discovery of nickel was reported in the far north-west of South Australia. This discovery is, apparently, influencing the Western Australian Government, although the lack of activity in following up the South Australian discovery, is causing doubts as to the value of the find.

Future Trends in U.K. Coal Mining Operations

There is a definite limit to the benefits accruing to U.K. coal mining from such measures as the recruitment of additional manpower and short term development schemes, and the prosperity of the industry undoubtedly depends on the rapid and successful completion of a long-term programme of reconstruction and new sinking. This opinion was expressed by F. Marsh, chief planning engineer, National Coal Board, and W. Rowell, deputy production director (planning) of the Scottish Division N.C.B., in a paper entitled *The Mine of the Future* from which the following article is condensed. The paper, which was presented at the Centenary Congress of the Société de l'Industrie Minière held in Paris during June of this year presents interesting conjectures as to the possible future trends of coal mining in the United Kingdom.

The major problem confronting the mining industry is the handling of materials in large quantities. Increasing depths of workings and difficulties in mining are factors which have a big influence in determining the economic size and winding capacity of British collieries. The trend is towards larger collieries and this trend is expected to continue and may even be accelerated.

The development of this trend has, however, been somewhat restricted. It has been assessed that a colliery with a capacity of from 4,000 to 6,000 tons per day saleable output is about the optimum size, having regard to economic aspects and to problems of managerial and technical control. Experience of labour control suggests that a labour force of from 2,000 to 3,000 men is the maximum number that can be effectively controlled as one management unit as, under British mining conditions, the workings at a colliery with a very large output soon become too widespread for the transport of men and for ventilation without satellite shafts.

In pursuance of the trend towards increased handling capacity, and hence efficiency and productivity, it is suggested that these restrictions could be obviated by providing a central winding shaft or shafts for a group of collieries. These collieries would then remain complete management units, each with its own ventilation and supplies system, but having all coal transported underground on main horizons to a central winding point for hoisting to the surface, preparation and distribution.

THE EFFECT OF MARKET DEMAND

There are indications that changes in market demand may ultimately effect the technique of mining. In spite of the rising proportion of "smalls" in coal as now mined, it seems likely that the demand for smaller size grades will equal or even exceed the output of run-of-mine "smalls". If this is so then the amount of degradation of coal, which is an important factor at the present time, will cease to be of such consequence and will permit more freedom to be exercised in the use of:

- high capacity machinery for coal-getting;
- underground and surface bunkers for absorbing peak loads, storage, blending, etc., and
- high capacity mine cars, skips and materials handling equipment.

With the development of high-voltage transmission lines and increasing transport costs there is a definite trend towards the erection of power stations nearer to fuel

INCREASING WINDING CAPACITY OF U.K. COLLIERIES

Approx. Daily Output (Tons)	Total Number Collieries (Per cent)		
	1945	1953	Estimate 1960/65
Under 1,200	82	71	48
1,200 - 2,000	13	18	17
2,000 - 2,900	4	6	14
2,900 - 4,000	1	4	10
4,000 and over	—	1	11

sources rather than at load centres. There is, moreover, a definite supporting trend towards a considerable increase in the use of pulverized fuel, indicating an increasing demand for relatively dry untreated smalls.

All these trends lead to the conclusion that it will be advantageous to bring coal to the surface in a dry state for treatment and blending at a central preparation plant directly linked to a large electricity generating power station.

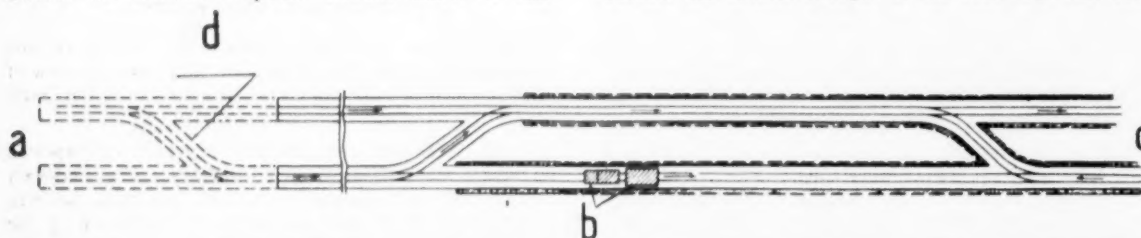
It may be considered that the mine of the future will be a composite organization with the following general features:

- A group of collieries linked by an underground coal transport system to a central coal winding shaft or shafts;
- Output from the collieries transferred via staple shafts, underground vertical bunkers and loading stations to high capacity mine cars on the central transport system;
- A combined output of about 30,000 tons per day of run-of-mine coal prepared at one central plant incorporating blending bunkers for ensuring consistency of quality;
- A surface layout at the central shaft comprising the preparation plant and additional installations.

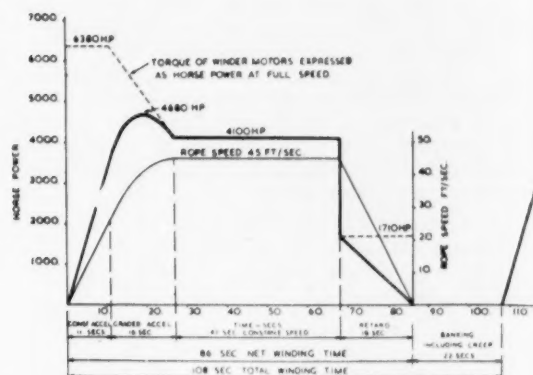
These additions would include a pulverized-fuel-fired power station, a carbonization plant (if coking coals are available), a chemical plant, a brickworks and other plant using waste materials.

CENTRAL TRANSPORT SYSTEM

The first essential decision to be made in designing colliery projects is the capacity and type of mine car to be used. With the large scale change-over to horizon mining methods involving a considerable expansion of tunnel drive, this type of roadway is not very satisfactory because the natural strength of the rock arch has been



General arrangement of duplicate tunnels during driving and concreting, showing (a) continuous driving, (b) concrete machine retreating, (c) completed roadways and (d) connections according to stability of rock arch.



Leading particulars of the No. 1 shaft winders

seriously reduced by the effects of blasting, the arch girder is not a very efficient method of support, and the floor or pavement is relatively weak and hence the stability of the cross-section is low.

Since the times taken to sink shafts and drive tunnels are the predominating factors in enabling projects to be completed rapidly, it is imperative that the speed of tunnel drive in reconstruction and new winding projects should be as high as possible. For this reason, some of the methods used by big civil engineering firms should be adopted for underground drive. There is little doubt that an efficient tunnelling machine will eventually be developed, probably by adapting the tricone rotary disc wheel cutter used for drilling deep oil wells at high speed.

A feature of the central transport system of the mine of the future would be twin, circular concrete, or "gunite", lined tunnels of about 10 ft. dia., each tunnel having a single track for large capacity cars. Either a 10-ton capacity solid bottom or a 6/7-ton drop bottom mine car can be accommodated in such a roadway.

CENTRAL WINDING SHAFTS

The maximum degree of continuous winding will be the logical outcome of the present trend towards full mechanization of coal-getting when it will no longer be necessary to employ the largest proportion of manpower on the coal filling shift with a bias towards concentrating production on the day shift.

The authors have assumed a winding depth of 3,000 ft., and a daily output of 30,000 tons of raw, run-of-mine coal. Two 24 ft. dia. concrete-lined shafts would require to be sunk, No. 1 Shaft being fitted with two balanced skip winders for coal-winding only and No. 2 Shaft fitted with one balanced cage winder for the following duties:

- Winding of stone and materials in connection with the drive or extension of the main underground central transport system;
- Withdrawal of central-system mine cars or locomotives for replacement or repair (general maintenance only being carried out underground);
- Winding of the men engaged on the transport system;
- Winding of a proportion of the output if required, and, possibly, stone from the satellite collieries.

The shafts would be equipped with streamlined reinforced concrete buntons supporting timber guides, both skips and cages being fitted with pneumatic rubber-tired roller assemblies. Skip and cage centres would be similar at 9 ft. 4½ in., giving a standard drum diameter for the three multi-rope friction winders.

No. 1 Shaft would be fitted with four light alloy skips and have two winding engines designed for hoisting 24,000 tons per day of 20 hours, thus allowing each winder to stand for four hours per day for maintenance. The single-decked cages in No. 2 Shaft would be designed to accommodate 10-ton capacity mine cars and to wind up to 6,000 tons of coal in 18 hours, allowing six hours for maintenance and the winding of men, stone and materials.

Again following present trends, multi-rope friction winders would be used. Fully automatic winders for No. 1 shaft would be mounted in a tower of which the main dimensions are:

Base of Tower	40 ft. × 26 ft.
Height to floor of Engine House	123 ft.
Dimensions of Engine House	60 ft. × 35 ft.
	× 27 ft. (high)
Total height from ground level to top of Tower	150 ft.

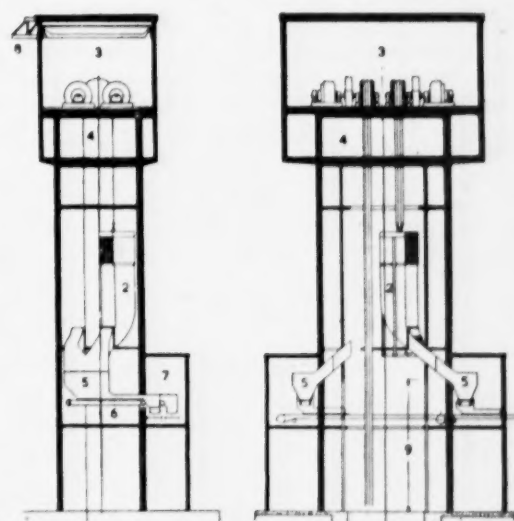
No 2 winder would be similarly mounted and would also be fully automatic.

The skip discharge at No. 1 Shaft would be completely automatic and load on to cross conveyors and thence via conveyors to the coal preparation plant. Manpower at No. 2 Shaft would also be kept at a minimum.

OTHER ARRANGEMENTS

In the handling and loading of empty wagons and the weighing and marshalling of loads, the use of modern wagon handling equipment should effect considerable savings in manpower. The extended use of the much favoured trolley system will undoubtedly be restricted by British mining conditions and safety regulations.

To obtain an efficiency comparable with the trolley system the authors imagine that the locomotive of the future may be of the electrogyro type, equipped with double fly wheels and axle-hung A.C. traction motors. These would weigh approximately 20 tons each and be capable of a maximum tractive effort of about 10,000 lb. Each locomotive would be able to haul a train of 450 tons gross, i.e. 300 tons coal, at speeds up to a maximum of 30 m.p.h. Maximum length of run would be about five miles



Section and plan showing arrangement of No. 1 shaft tower. (1) shaft, (2) 18-ton capacity skip, (3) winder house, (4) winder auxiliaries including MG set, (5) discharge chutes, (6) plate belt feeder, (7) coal conveyor to washery, (8) cantilever extension to crane girder, (9) headroom required for skip changing

and scheduled time for each run, start to stop, would be of the order of 15 minutes, depending on the distance.

The shaft bottom layout would be designed to eliminate gradients, track cross-overs, etc., and to enable trains to move only in one direction along specific single track roadways with the exception of No. 2 pit bottom and the back shunt. The trains, which might comprise thirty 10-ton capacity cars, would be drawn by a locomotive with a driver and a guard. The entire shaft bottom traffic arrangements would be controlled from the central control station.

There would be a limited number of loading points in the system and therefore each should be of a very high capacity and capable of loading up to say 3,000 tons or

more per shift; this conforms to present trends. With a central control system it would be essential that large areas of coal from various sub-horizons should be loaded at one point. The loading of mine cars at the foot of bunkers would be controlled by power operated quadrant doors. For the all-important maintenance of good air conditions, more instrumentation would be used in collieries and at the satellite pits ventilation could be under constant control from a surface control station.

The increasing standardization of materials and the use of central workshops and stores for a colliery group should go some way towards resolving the difficult problem of materials handling.

World Development Record in Czechoslovakia

The application of horizon mining principles into the collieries of the United Kingdom has reduced the gap existing between metalliferous and carboniferous mining engineering practice, while in addition the deep level development end bears a marked similarity to the faces advanced in the civil engineering projects recently reported in *The Mining Journal*. Development methods are, therefore, of allied interest irrespective of the type of ground-breaking work in which they are used. The following article describes a Czechoslovak drifting operation which is claimed to be a world record. The author, Blahomil Soukup, is editor of a Czechoslovak mining periodical.

A world development record was achieved in Czechoslovakia during 1954 when 952 yd. of 113 sq. ft. double track cross cut was driven in a month of working. Driving was completed through a strata composed generally of hard shale, and the 9.5 ft. by 11.8 ft. cross cut was provided with simple support with top lagging. The props were spaced at a distance of 9.8 ft.

WORKING OPERATIONS

In blasting operations, a wedge shot firing pattern was adopted consisting of 20 or 26 holes, the length of the holes ranging from 8.2 ft. to 10.7 ft. For wet drilling EDK-60 drills weighing 43 lb. with cylinder dia. 2.4 in. and mounted on air legs were employed, together with drill steel of 1.34 in. to 1.5 in. dia. and from 9.8 ft. to 11.5 ft. in length. Cemented carbide chisel bits were employed, and 15 machines were used throughout the operation. The air pressure was 113.8 lb. p.s.i., and water pressure varied from 142.2 lb. p.s.i. to 170 lb. p.s.i.

Broken rock was loaded with a PML-5 vertical arc loader of Soviet origin into 21.2 cu. ft. mine cars of 17.7 in. gauge. The capacity of the loader had been increased by enlarging the capacity of the bucket itself from 6.35 cu. ft. to 10.6 cu. ft. A plate crossing was used for handling loaded and empty cars.

Blasting was accomplished by gelatin donarite in 9.8 in. by 11 in. cartridges with ignition lines. A feature of the operation was that all supplies necessary for the project were concentrated at an auxiliary store on the level where development was taking place. From this point the supplies were brought to the working face before the beginning of a shift.

OPERATING STATISTICS

Output per month (yd.)	952
Total volume of rock (cu. yd.)	11,955
Average per shift (ft.)	30.7
Average per day (ft.)	92.0
Maximum per shift (ft.)	40.3
Maximum per day (ft.)	106.0
Average rounds per shift	3.82
Average rounds per day	11.5
Maximum rounds per shift	4
Footage per round	10.5
Loading capacity per hr. (cu. yd.)	76.0
Explosive ratio lb. per cu. yd.	3.8
Output per manshift (cu. yd.)	7.85

TIME ANALYSIS OF A ROUND

Operation	Minutes	%
Prepare to drill	3	2.4
Drilling	52	41.5
Timbering	30	
Laying rails	50	
Charging and blasting	20	15.9
Clearing gas	5	4.0
Prepare to load and transport	3	2.4
Loading and transportation	42.4	33.8
Total	125.4	100.0

The working crew was divided into four teams which worked continuously for three days with one day's interruption. A working team comprised one shift boss, six drillers, three helpers, and four trammers. Besides the four teams each consisting of 15 men, there were two electricians and five machine men in the crew so that the total personnel of the entire work crew numbered 63.

GENERAL ORGANIZATION

The technical staff in charge of the development operation comprised seven men, and was made up of one foreman, one mechanic, one electrician, and four overseers. Despite this fact, however, all the crew personnel were skilled in various trades, a factor which enabled them to perform functions other than those relevant to their immediate duties as members of the development crew. For example, the drillers who had finished drilling helped to lay rails or extend pipe lines, and in their turn the mechanics drilled if their particular duties were completed. The average number of rounds completed per shift was 3.8.

The operation was so organized that drilling equipment was brought to the working face while loading was being completed to ensure that drilling commenced with the minimum possible delay after face clearance. Nine operators were detailed to drilling duties and 12 drills was the maximum number which worked simultaneously. Track laying and timbering were carried out at the same time as drilling.

It was found that an allowance of five minutes for fume clearance was sufficient, as blast atmosphere was speedily cleared by means of compressed air and water sprayed out with a jet mounted on the water pipe and connected to the air line.

The Copper Refinery Project at Mufulira, Northern Rhodesia

The £4,000,000 copper refinery project now nearing completion at Mufulira is part of a general programme of refinery construction on the Copperbelt. This article briefly describes the new Mufulira refinery—the electrolytic tankhouse of which began operations in November, 1952—and it is interesting to note that construction has begun of another refinery at Ndola where copper from the Roan Antelope Mine at Luanshya will be treated. Both properties are members of the Rhodesian Selection Trust group, and for one group to engage in two such vast refinery projects simultaneously is a notable undertaking.

Mufulira Copper Mines Ltd. has a yearly output of more than 90,000 l.tons, and at one time sold all its copper in the relatively impure blister form which necessitated refinement overseas. To ensure that the shape and purity of Mufulira copper would command the highest possible price, however, the decision was taken to erect an electrolytic refinery at the mine.

In 1949 the clearing of land began for a first building covering three and a half acres. This is the £2,000,000 electrolytic tankhouse, which began operating in November, 1952; and is a complete unit, with its own boiler-house and electrical sub-station. Last May a further section of the tankhouse was brought into operation.

THE CASTING PLANT

The second part of the Mufulira refinery is the casting plant, planned to be in operation early in 1956. The construction of the casting plant was begun two years ago, and machinery and materials have been imported from Britain, the United States and Germany. When the new plant is fully operational the Mufulira refinery will be capable of turning out refined deoxidized copper as wirebars, cakes, billets and ingots.

A wirebar is, of course, a piece of very highly refined copper generally weighing about 250 lb., and 54 in. long, 4½ in. square, rounded at both ends. Eventually it is probable that most of the copper produced at Mufulira will be used by manufacturers to turn into copper wire, and a wirebar is the perfect shape for manufacturing to this end by hot rolling and cold drawing. Other shapes which will ultimately come out of the Mufulira refinery, such as billets, cakes and ingots are suitable for the production of such items as tubes and sheet and sections.

Newly-smelted copper arriving at the refinery passes to the tankhouse and is rendered to a minimum 99.9 per cent

purity by treatment with an acid electrolyte solution. It then has metallic impurities of about one part in a million. It is interesting to note that the residue produced in this processing has individual value as it is sold for the extraction of silver, gold and selenium.

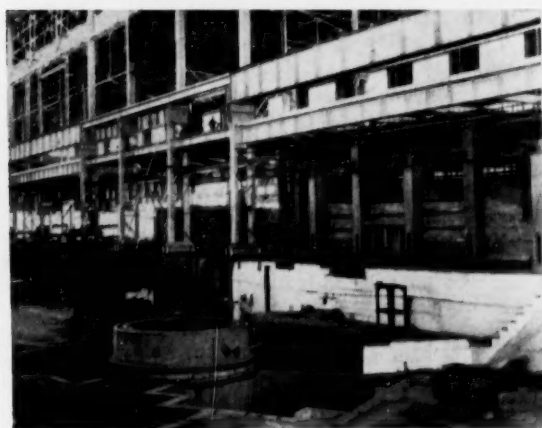
On leaving the refinery tankhouse the copper is in the form of cathode plates, 3 ft. square and ½ in. thick, a shape not suitable for immediate fabricating. This lack of preferred shape is the reason for the construction of the second refinery unit, namely the casting plant.

At the casting plant the cathode copper will be loaded into furnaces by charging machines. The furnaces, built of high quality refractory bricks, will be 57 ft. long and 18 ft. wide. Each will have a nominal capacity of 220 tons. As the molten copper leaves the furnaces it will be poured into moulds around a 32 ft. dia. casting wheel. This wheel will gradually rotate, and the red-hot wirebars will be quenched in a water-filled pit. The whole cycle of furnacing and casting operations will take 24 hours.

DEALING WITH IMPURITIES

The melting of the cathode copper in the furnaces has raised various problems. For example, the copper picks up impurities, particularly sulphur, from the pulverized coal used for firing. These impurities must be removed, but in doing so the copper is given an excess oxygen content. This in turn is overcome by inserting green tree-trunks beneath the surface of the molten copper. The art of casting refined copper is in this careful control of the final oxygen content.

At all stages the copper is transported entirely mechanically, and the refinery is equipped with five diesel locomotives and 200 trucks. Close to the casting plant is a machine shop, housing machinery for the making of the copper moulds. Of the three largest pieces of equipment, one is British, one German and one American.



The Mufulira casting plant. Right, the first of the two furnaces is being built, while on left is seen the wheel for the casting of wirebars



Construction in progress in the casting pit at Mufulira Copper Mines Ltd. On the left the conveyor system and inspection aisle take shape

Advances in Geochemical Prospecting

Geochemical prospecting depends on the fact that soils, water, stream sediments and plants in the neighbourhood of orebodies frequently contain higher concentrations of minerals than are normally present. These anomalies have come about as a result of the redistribution of the primary geochemical dispersion of the metals constituting the mineralization, due to the effects of physical or mechanical, chemical or biological agencies. The following article describes certain of the simple and rapid techniques for the determination of trace metals in geochemical prospecting which have been developed during recent years by the Chemical Research Laboratory of the Department of Scientific and Industrial Research. It is evident that the development of these procedures is of great value in assisting the geochemical prospector to overcome the difficulties presented by the large number of determinations he is called upon to make.

The extent to which secondary dispersion takes place is clearly dependent on local conditions and also, of course, on the properties of the particular metals concerned. It is evident, however, that in favourable circumstances the presence of a sub-cropping orebody covered by a layer of residual soil can be revealed by local variations in the concentrations of trace metals.

The success of the geochemical method depends on systematic sampling of the area under investigation and consequently on the analysis of a large number of samples. Prospecting is carried out on a grid pattern. In flat terrain, samples might be taken at intervals of 100 ft. along traverses 100 ft. apart, involving a total of about 3,000 samples per square mile. Cheap and rapid methods of analysis are thus essential; on the other hand, a high standard of accuracy is not required, since the prospector is only concerned with variations which are sufficiently wide to be significant. When operating on the Copperbelt, for example, the existence of an underlying orebody might be indicated by a rise in the copper content of soil samples to perhaps 500 p.p.m., when the general run of samples were yielding values in the region of 50-75 p.p.m.

SIMPLE AND RAPID TECHNIQUES

For several years the Chemical Research Laboratory of the Department of Scientific and Industrial Research has been developing simple and rapid techniques for the determination of trace metals in geochemical prospecting. A chromatographic separation process, which can be completed in 30 minutes or less, has been devised for use in the field, the apparatus consisting of a 600 ml. glass or polythene beaker fitted with a lid. The technique is being applied with satisfactory results to the determination of copper, cobalt and nickel in soils, which can be accomplished in a single separation; to the determination of niobium and tantalum in the same soil extract; and also to the determination of uranium, lead and bismuth. The accuracy obtainable is quite sufficient for field requirements.

The general practice in preparing extracts for chromatographic separation is to rough crush the soil sample and sieve through an 80-mesh sieve. A torsion balance or a scoop is used for measuring out quantities. The method of breakdown varies in detail according to the metal to be determined, but in each case the separation is carried out on specially designed sheets of Whatman's No. 1 filter paper, which are now available commercially, and enable determinations to be carried out simultaneously on ten sample solutions.

The ease and speed with which samples can be analysed by this technique were recently demonstrated to *The Mining Journal*. The procedure employed for the separation of copper, cobalt and nickel from the same soil sample was as follows:

Using the -80 fraction, 0.5 g. of the soil is weighed into a Pyrex test tube, 1 g. of powdered potassium bisulphate is added, and the contents of the test tube are thoroughly mixed. The mixture is fused gently for one minute. The melt is allowed to cool and is then broken

down by the addition of 2 ml. of 1:1 hydrochloric acid containing 5 per cent v/v of concentrated nitric acid. After the acid has been added the tube is heated for ten minutes in a boiling water bath and is then removed and allowed to cool.

Using a capillary pipette, which can be filled merely by touching the surface of the liquid, on 0.01 ml. aliquot of the clear supernatant liquid from the settled sample solution is applied close to the end of one of the strips in the specially designed filter paper; it spreads right across the strip, forming a rectangular patch. Ten sample solutions are applied in this manner, the two end strips being left vacant.

The sheet of paper is then bent to form a cylinder and fastened in this position by a paper clip. The cylinder is placed in a 600 ml. beaker floating in a boiling water bath, the sample spots being at the lowermost ends of the strips. After drying for three minutes it is transferred to a beaker containing 25 ml. of a solvent mixture prepared by adding hydrochloric acid and water to methyl ethyl ketone. When the solvent has diffused almost to the top of the strips, the cylinder is removed from the beaker and left standing for five minutes to allow the solvent to evaporate. It is then stood for two minutes in an atmosphere of ammonia vapour. The paper clip is next removed, the sheet is spread flat, and both sides are sprayed slightly with an 0.1 per cent solution of rubeanic acid. This reagent acts as a detector by producing the characteristic colour bands which are the basis of chromatographic separation.

REVEALING NATURE OF CHROMATOGRAMS

Due to the differences in the partition coefficients of the various metal salts between the water held in the filter paper and the organic solvent, the salts move at different rates up the strip. Iron travels furthest and is detected by a brown band near the top of the strip, while nickel appears as a blue-purple band which has barely moved upwards from the test spot. Between them are an olive-green band and a yellow-orange band representing copper and nickel respectively.

The chromatograms so obtained are compared with a suitable range of standard strips obtained from solutions containing known weights per 0.01 ml. of the metals to be separated. These standards, which will keep for several months, cover a range of values which might extend, for example, from 20 to 2,000 p.p.m. and are prepared by using a series of solutions containing the appropriate weights of each metal per 0.01 ml. The result is accurate within ± 30 per cent. About 80 separations can be carried out by one person in a single day.

The field method recommended for the determination of niobium in soils involves the separation of this element together with tantalum, if present, from other metals in the sample solution. The soil extract is prepared by weighing 1 g. of the soil into a 10 ml. polythene beaker, adding 5 ml. of 40 per cent w/w hydrofluoric acid, and evaporating to dryness on a water bath. A further 2 ml. of dilute hydro-

fluoric acid is then added by means of a polythene pipette fitted with a rubber bulb. The mixture is stirred with a polythene rod and allowed to stand for 30 minutes. The solvent recommended is prepared by mixing hydrofluoric acid and water with methyl ethyl ketone.

After an aliquot of the sample solution has been applied to the sheet of filter paper, the sheet is allowed to dry in the atmosphere for one hour. The solvent is prepared and about 20 ml. is poured into a 600 ml. polythene beaker half an hour before the paper strip has finished drying. The sheet is clipped to form a cylinder and inserted into the beaker, the time taken for the solvent to diffuse upwards being about 20 minutes. After the solvent has been allowed to evaporate the strips are exposed to ammonia vapour for three minutes. The sheet is then spread flat and sprayed on both sides with a 2 per cent aqueous solution of tannic acid. This detector is sensitive only to niobium and virtually eliminates interference from tantalum. Niobium is found as an orange yellow band near the top of the strip. The intensities of the niobium band colours relating to the sample solutions are compared visually with those of standards. This procedure allows about 60 determinations to be carried out per analyst per day with an accuracy of ± 50 per cent or better.

There being no specific test for tantalum, this metal has to be separated from niobium chromatographically in order. The solvent is again prepared by mixing hydrofluoric acid, water and methyl ethyl ketone. The sheet is sprayed with quinalizarin solution as the reagent, and is exposed first to ammonia vapour for a few minutes and subsequently to acetic acid vapour for a further few minutes. Tantalum can thus be recognized as a narrow mauve pink band in the solvent front. Any niobium present is detected as a similarly coloured band between the original spot and the tantalum. It is possible by this method to separate tantalum and determine as little as 4 p.p.m. of Ta_2O_5 in the soil.

By suitable preparation of soil extracts and the use of appropriate solvents and detectors, the uranium content of soils and rocks can be determined down to 2 p.p.m. The recommended solvent is an ethyl acetate-nitric acid mixture and the detector an aqueous solution of potassium ferrocyanide. Satisfactory results are also obtained from the chromatographic separation of lead, the solvent used being a mixture of methyl alcohol and hydrochloric acid.

Similar methods can be used for the analysis of plant ashes obtained in biogeochemical prospecting work.

COLORIMETRIC DETERMINATIONS

Paper chromatographic methods cannot readily be applied to the determination of trace amounts of certain elements, such as tungsten and molybdenum, in soils. Field methods based on modified laboratory colorimetric procedures have therefore been developed, photometric measurements being replaced by visual comparison.

The solids are fused with a modified carbonate flux and the melts are leached with water. Aliquots of the aqueous extracts are used for the determinations. At temperatures in the region of 100 deg. C., the blue-green tungsten dithiol complex is extracted selectively into amyl acetate, from concentrated hydrochloric acid solutions containing stannous chloride, which prevents the molybdenum complex from being formed. At low temperatures (20-25 deg. C.), the yellow-green molybdenum dithiol complex is extracted selectively into amyl acetate from dilute hydrochloric acid solutions. The blue-green or yellow-green dithiol complex (as the case may be) is contained in a layer formed on the surface of the solution, which is deep enough for determinations to be made by visual comparison of the colour in-

tensity with standards, the comparison being made against a white background.

Procedures have been developed which allow 30 or more determinations to be made per man day, using simple apparatus. Molybdenum can be determined in soils over the range 1 to 100 p.p.m. and tungsten over the range 4 to 400 p.p.m., the accuracies obtainable being fully sufficient for geochemical purposes. By simple modifications of the procedures greater quantities of the metals can be determined.

A colorimetric method is also available for the determination of chromium in soils. A suitable quantity of soil is fused with sodium hydroxide and sodium peroxide in a nickel crucible. The melt is leached with water and the contents of the crucible are transferred to a graduated test-tube, which is heated for several minutes in a boiling water bath. A small quantity of alcohol is added and the solution is held at a temperature just below boiling for a further two minutes. The solution is then filtered into a dry test tube and its colour intensity is compared with standards.

U.S. Coal Revival Grows

In the U.S. the recent wage contract negotiated and signed by John L. Lewis, President of the United Mine-workers, and the principal Bituminous Coal Operators Associations has been reflected by an immediate increase in the selling price of coal. This immediate shifting of the load on to the public no doubt explains why the negotiations between the fiery John L. and the B.C.O.A.'s. were characterized by an unusual lack of acrimony. The increases in coal selling price range between 25 and 40 c. per ton.

Under the new agreement, wages of soft coal miners advanced by \$1.20 per day as from September 1, and a further 80 c. per day on April 1, 1956. This will raise the present basic daily wage of soft coal miners from the former \$18.25 to \$20.25, in line with the automobile and steel industry pay scales.

The new contract also provides for higher rates of pay for weekend work. The coal operators smartly got round this clause by instituting new shift schedules ensuring that the working week finishes at 12 p.m. Fridays. This action resulted in a few localized strikes but the union have apparently accepted the *fait accompli*, and trouble on a big scale is not anticipated.

The timing of the new increases is just right as the U.S. bituminous coal industry is recovering rapidly from the precarious state it has been in of recent years. Demand for soft coal at 9,500,000 tons weekly is almost 25 per cent higher than in 1954. This is attributable to greatly increased internal industrial activity and to the current export boom. Exports this year are expected to at least double the 15,000,000 tons of last year. Under this stimulus of increased demand U.S. coal production this year is expected to reach 470,000,000 tons—80,000,000 tons more than in 1954. Output per manshift in the U.S. soft coal mines has increased by almost 40 per cent since 1940 and on a national basis now stands at 9.773 tons.

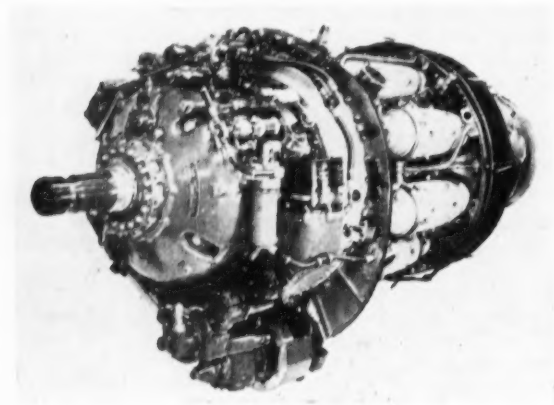
Of particular interest is the reversal of the widespread trend from coal to oil. In the U.S.—notably in utility operations—coal is gradually regaining its hold at the expense of oil. This change of policy is illustrated by the decision of the Tampa Electric Co. to open a new coal powered plant in 1957, the first time this company has used this fuel for electricity generation in Florida. The underlying reason for this departure from accepted practice is stated as being the tendency for oil prices to fluctuate widely.

MACHINERY AND EQUIPMENT

Titanium Used in British Aircraft Engine

The Bristol Proteus 755 turboprop engines which power the long-range Bristol Britannia airliners will achieve the distinction of being partially constructed of titanium. The titanium is used to replace stainless steel and as it is 42 per cent lighter, whilst possessing equivalent properties, the Bristol Aircraft Company have estimated that the total weight saving will be about 560-lb. for each aircraft.

The largest units to be fabricated in titanium will be jet pipe shrouds; other components to be manufactured in the metal include the inner cowl skin, the turbine shroud and the rear fire wall on the plenum chamber.



The Proteus 755

Titanium is, of course, one of the newest metals to be used in aviation, although its actual employment has been held up owing to the difficulty of producing the metal and its alloys from the raw oxide owing to its sensitivity to impurities, most of which have a direct bearing on its properties and behaviour.

The Bristol Aeroplane Company has, for some time, been experimenting with the manufacture of components in titanium and its alloys and is one of the first British companies to go into production with titanium components for aircraft use. Originally, titanium metal supplies were imported from the United States but the company now receives its titanium from I.C.I. whose new process for the production of titanium metal involving the use of sodium has put Britain in the lead of all those countries which are now developing titanium for commercial usage.

Earth Testers for Geophysical Prospecting

Among the equipments used in geophysical prospecting activities is the range of Megger earth testers manufactured by Evershed and Vignoles Ltd.

There are two general methods of making resistivity observations. In one, a constant electrode separation is employed, so that the current penetration is roughly constant, observations being made with the four equally spaced electrodes situated at various points along a straight line, so that horizontal changes are detected. In the second, the electrode system is expanded about the mid-point, so that resistivity observations are obtained for increasing depths, thereby allowing vertical changes to be investigated.

These tests can be carried out very simply by the Geophysical Megger Earth Tester, and within its limitations by the Low Resistance Megger Earth Tester, both instruments providing their own testing current.

The Low Resistance Megger Earth Tester consists of a hand-driven generator and a direct reading ohmmeter contained in a strong hardwood case. The Geophysical Megger Earth Tester comprises two units, one containing a hand generator,

two reversing contactors and a current indicator, while the other contains an ohmmeter, a galvanometer, a range switch and an adjustable potential divider.

A Range of Surveying Instruments

An interesting booklet from Cooke Troughton and Simms Ltd., gives details of the manufacturers' theodolites, levels and geodetic equipment. The instruments discussed are graduated upon the Sexagesimal system (360 deg.), although any instrument can be supplied with Centesimal graduation (400 g.).

Among instruments discussed are the Rand Vernier Theodolites V102 and V104, primarily intended for underground surveying, and which can be fitted with optical plummet and auxiliary telescope. The Mining Dial, V811, can be revolved about a second vertical axis and provides Azimuth graduation to 2 deg. and altitude graduation to single degrees of elevation and depression.

Other units presented in this interesting booklet include beacon lamps, surveyor's levels and ancillary equipments.

Mobile Dragline Cranes for Oilfields

Novel equipment now on its way to British Borneo consists of two lorry mounted 19-RB superstructures, supplied by Ruston-Bucyrus Ltd. and to be operated by the British Malayan Petroleum Company Limited, a Shell Associate. The operational site will be Seria, to-day one of the largest single oilfields in the British Commonwealth, with a production of some 5,000,000 tons a year. The machines will be used for mobile crane operation, with Clamshell attachments for the handling of stone, sand and general construction material, for dragline operation, loading fill into tip trucks and excavating drains and canals.

The same boom, 35 ft. long in 2 sections, of 15 ft. and 20 ft., is used for each operation. A 5-ton single sheave block (pulley and hook) is fitted to the lifting crane and a 7/9 cu. yd. bucket is supplied with dragline gear and the grabbing crane is equipped with a 14/17 cu. ft. grab. The basic vehicles are Scammell Constructor 6 by 6 chassis, powered by Rolls Royce C6NFL 6-cylinder 12.17-litre engines having an output of 160 b.h.p. at 1,800 r.p.m. The cranes are highly mobile and will be particularly useful when required on different sites within a short period, especially in the difficult conditions prevailing in British Borneo.



Two lorry-mounted 19-RB excavator cranes

METALS, MINERALS AND ALLOYS

COPPER.—After three reductions, which brought their price down to 45½ c. per lb., the custom smelters have held steady at that level during the past week. Indeed, in London in the latter part of the week copper staged a recovery, probably because the earlier fall had been a bit precipitate and the impression gained ground that it was still possible that copper was a bargain at the lower prices. America's custom smelters no doubt rely on some substantial inventory buying to maintain their premium over the big producer's price and since inventory-buying against tax assessment must shortly end, consumers are probably prepared to pay some little premium for a little longer.

It is understood that the producers are still pressed to meet the demand at 43 c. and could sell more copper if more were available; they see no reason to cut their price yet. However, if it is inventory-buying that is maintaining the custom smelters' premium then the fall, when it comes, will be the sharper. It will then be interesting to see whether the custom smelters revert to their old practice of following the E.M.J. quotations or maintain their independence of it. There are considerable disadvantages—not to mention some unfairness—in having a split price, but there is no denying that the custom smelters have imported a certain realism to the American price structure.

Meanwhile, the Department of Commerce has dropped restrictions on the export of refined copper of foreign origin during the fourth quarter although it is maintaining control of destination. Restrictions are, of course, maintained on copper of domestic origin. The restrictions on the "foreign" copper were extremely unpopular and to some extent dangerous since they could frighten off foreign ores; too much, therefore, should not be read into the lifting of these restrictions since only a slightly better supply-demand situation was enough to discount their value.

The question arises, now that copper prices have moved into a decline, of how far they will go. Mr. Charles Ince, of St. Joseph Lead, said this week that if a price of 43 c. were long maintained consumption would be cut. "That is why copper producers have been uneasy, and that is why they are unhappy about the recent weakening in the price structure. One can say with reasonable certainty that further price movements in copper will be downward, but how far is anybody's guess." Mr. Milliken, vice-president of Kennecott Copper, is reported to have said that "a little over 30 c." would be a reasonable price for the metal and would encourage consumption. He expects copper sales not to fall in the United States in 1956 although they will "fall considerably" in Europe.

It is quite possible that there will be some falling off in Europe in 1956 from the very high level reached this year but, although most European countries are now restricting credit, they expect to avoid any substantial falling off in production. Furthermore, there is every prospect of a stronger copper demand from the Iron Curtain countries. American copper producers have consistently underestimated the strength of European demand in the last two years, and with disastrous consequence. It must be hoped that they will see that they are better informed in future.

The *Wall Street Journal* quotes a copper trade spokesman as saying that a price "somewhere between 30 c. per lb. and 40 c. per lb., possibly around 36 c., would be a level at which copper could compete favourably with aluminium." Although the trade has been impressed by Western Electric's decision to move to aluminium for telephone cable, it took a price of 43-50 c. to make the change and what the rise of the last year has shown is the unexpected firmness of demand at prices above 30 c. It seems likely that, although the American producers were very reluctant to move off 30 c. this year they will be equally reluctant to get back to it.

It also remains to be seen what R.S.T. will do now that L.M.E. quotations have been below their fixed quoted price. It by no means follows that R.S.T. will feel compelled to make a cut since they have always insisted on stability and there is no wide diversion as yet between their own price and those on the L.M.E.

It is reported that the Chileans have become impressed with the danger of aluminium as a competitor, but that does not mean that they are reconciled to a severe drop in price. It is one thing to express caution, it is quite another to see the bottom drop out of the national exchequer and the Chileans would be faced with a severe financial problem if copper were to go at all quickly—say within six months—to 30 c. or thereabouts.

The strike at Chuquicamata was finally settled in October 8 when the company granted increased pay and fringe benefits

which at the present rate of exchange are said to cost \$1,250,000. It is believed that the company has asked for a more favourable exchange rate but they are even less likely to get it now that copper prices have fallen.

At Kitwe deadlock has been reached in the negotiations between the African Mineworkers' Union and the Chamber of Mines over the Union's demand for a pay increase of 6s. 8d. per shift. The African Union is now discussing what further steps it should take.

LEAD.—The chief event in the American lead market last week was the announcement that General Services Administration was in the market for metal at 15½ c. per lb. New York. This ended a good deal of speculation both as to whether G.S.A. would buy at the price and as to whether—if it did not—lead would relapse immediately to 15 c. Not much metal is expected to change hands because commercial demand is brisk but the offer has been made. If it puts an end to one talking point, the offer opens up another. A good many observers had seen 28 c. as a likely combined price for G.S.A. to go for, but producers can now get 28½ c. Is there any reason why G.S.A. should not go higher still? American producers have, of course, publicly set their sights a good deal higher; 30 c. has been commonly mentioned as a nice round profitable figure and some of the more enterprising have talked of even better things. Of course the higher G.S.A. is pushed, the more risky does it become to push prices further. But whether the next rise comes from lead or zinc, it now seems unlikely that a combined price of 28½ c. will be the limit. Mr. Charles Ince, sales manager of St. Joseph Lead, has said that he foresees a continued good demand for the metal. "Some further change in price may be expected, particularly if European markets move substantially, but a stable price structure for a long period is much more likely."

Meanwhile, demand for lead has been steady to good with demand for batteries outstanding, with consumers quite prepared to pay the new price and now strengthened in this view by the apparent willingness of G.S.A. to pay it too. Stock of refined lead in the hands of smelters and refiners on September 1 stood at 26,859 tons against 30,077 a month earlier. A year earlier they were 72,150 tons.

TIN.—Tin has been steady and featureless in New York, although the metal had enough strength to maintain a level of over 96 c. per lb. for spot straits metal in spite of continuing uncertainty on Wall Street. There is no doubt of the continuing good demand for the metal and were it not for the uneasiness caused by President Eisenhower's illness tin might well be at higher levels in reflexion of the constant optimism of statistical forecasts.

In Indonesia enough votes have been counted to show the shape of the voting. The Socialists have been virtually wiped out. The Nationalists emerge as the strongest party with the various brands of Moslem parties close behind and the Communists very strong. A coalition government is inevitable but it is not clear what the alliances will be. It seems to be premature to preclude the possibility of the Communists participating in a government. The influence of the election on Malayan elections, should the Communist Party be legalized, may well be considerable.

ZINC.—Prime Western zinc has been in steady request in the United States on the basis of 13 c. per lb. East St. Louis and the very strong demand for special high grade zinc has continued. The G.S.A. has again entered the market for supplies to be delivered by December 15 but offerings are bound to be light because of the soundness of demand and the low level of stocks. Talk has again revived of an increase in the price of special high grade from 14.50 c.

There is little doubt that, with demand exceeding supplies for many months past the market could bear a greater spread and in many ways it is surprising that it has not developed earlier. The motor industry has had a very successful year and is looking forward to another good one in 1956; investment plans are being revised strongly upwards. Nevertheless the die casting industry, which has absorbed the special high grade, has been working pretty solidly for the motor industry and zinc producers may well have felt nervous of their very heavy dependence on that particular outlet.

Meanwhile, slab zinc stocks in American smelters at the end of September were at the lowest level since May, 1952. End-September stocks were 42,167 s. tons against 46,084 a month earlier. September slab zinc production was 83,448 tons against 84,874 in August. September deliveries were only 87,365 tons (83,664 domestic, 1,274 export and drawback, and 2,427 government account) compared with 90,080 in August. Unfilled orders

at the end of September dropped to a new low for the year at 52,278 tons against 73,632 at the end of August.

ALUMINIUM.—The U.S. Commerce Department's recent announcement that the fourth quarter quota for the export of scrap would be cut by 1,000 tons to 4,000 tons compared with the third quarter is a further reflection of the tight domestic supply position. Just how difficult this must be may be judged from the fact that whereas production of primary ingot is running at no more than 6 per cent above last year's figures, shipments of mill products are about 36 per cent up. In this situation it is hardly surprising to hear of Alcan once more urging the removal of U.S. import duties on primary aluminium. Pointing out that the States consumes more than half the free world aluminium output and no less than 40 per cent of Alcan's own production, Mr. W. B. Lambert, assistant general sales manager of Alcan, commented recently that current U.S. consumption as well as estimates of future requirements "make it abundantly clear that the capacity of U.S. aluminium smelters falls far short of that country's needs."

U.S. imports of bauxite are, of course, already free of import duty, but even so imports are nearly 250,000 tons down during the first half of this year compared with the first half of 1954, although Arkansas has made good most of this loss. In this context it comes as no surprise to read of plans for the Alcan group to accelerate its present programme of alumina production through its subsidiary Alumina Jamaica Ltd. Last March we reported plans for the early increase of plant capacity from 230,000 tons up to 300,000 tons, the new facilities being designed in such a way as to provide a basis for a further expansion of 150,000 tons at a later date. Not only has this "later date" come surprisingly quickly but the additional expansion now planned is not 150,000 tons but 243,000 tons. The intention is to complete this extension by mid-1957 at which point Alumina Jamaica will have a scheduled capacity of 543,000 tons per year for a total capital investment of \$60,000,000.

MANGANESE.—Having regard to the persistently difficult manganese position in the U.S., recent supply-demand figures published by the Bureau of Mines are of interest. These (expressed as s.tons of ore containing 35 per cent Mn or better) show a further sharp increase in the rate of domestic mined production which for the first six months of this year totalled 148,000 s.tons as against 115,000 tons for the whole of 1952, 157,000 tons in 1953 and 212,000 tons for the whole of last year. Imports are keeping up at about the same rate as last year when the total was 2,166,000 tons. It is clear, however, that consumption is rising much more sharply than supply, the total for the first six months of this year being 1,191,000 tons as against 1,658,000 tons for the whole of last year. This year's rate of consumption is about the same as in 1953, but in that year imports at 3,500,000 tons were 70 per cent better than the rate over the past 18 months. Imports are going to have to be stepped up again and the importance both of India and the U.S.S.R. in this picture needs no stressing, although it remains to be seen to what extent South African and Brazilian shipments can be boosted.

Meanwhile, news comes of further attempts to develop an economic process for treating low-grade domestic ores. Last month the G.S.A. announced a contract with Ore Beneficiation Inc. for the erection of a pilot plant at Joplin to handle slag and low-grade ores from various parts of the country. From time to time there have been reports from the States of economic processes having been developed for recovering manganese from open-hearth furnace slags, but we have no knowledge of any of these being successful as yet.

NICKEL.—Reports have appeared in the American press of new nickel deposits discovered by INCO in Northern Manitoba. The new area is stated to lie about 40 miles north of big deposits staked earlier by this company in the Mystery Lake-Moak Lake region.

The O.D.M. has announced the diversion of a further 1,250 s.tons of nickel from stockpile shipments during this month bringing the total so far diverted this year to 7,875 s.tons, which is expected to result in a somewhat increased overall supply of nickel for non-defence users this year against last.

The London Metal Market

(From Our Metal Exchange Correspondent)

The copper market has so far failed to settle down after the recent change of outlook, and on Friday, October 7, it reached its lowest quotation for some time following news that the U.S. customs smelters had reduced their price to 45½ c. per lb. Subsequently, second thoughts indicated that a London Metal Exchange price of below £340 was not justified under present conditions and a recovery set in.

With the labour situation on the mining side of the industry now being clear for the first time for over fifteen months there has been talk about what should be the correct price for copper, and this has led to a number of widely differing estimates, but the general opinion appears to be that prices will be maintained at the present level for some time to come owing to the high rate of consumption, the necessity for works to rebuild stocks, and the liability to deliver to the U.S. stockpile those tonnages of copper which have been diverted to industry during the last few months. If output remains uninterrupted it is considered that production costs do not justify the present level over a long period, and a minority think the general level may sink as low as 30 c. per lb.

The backwardation in tin has increased, which is the natural market reaction to decreasing stocks, and it is expected that the present figure will prove sufficient to rectify the position. Consumer demand remains good, and statistics up to date point to the fact that consumption plus stockpile intake may exceed production for this year. On Thursday morning the Eastern price was equivalent to £761½ per ton c.i.f. Europe.

The lead and zinc markets have been slightly unsettled by the fluctuations in copper, but few people think that there is likely to be any serious setback, more especially so as the U.S. stockpile authorities appear to be prepared to continue buying monthly tonnages at the current prices.

Closing prices and turnovers are given in the following table:—

	October 6		October 13	
	Buyers	Sellers	Buyers	Sellers
Copper				
Cash	£357½	£358	£353½	£354
Three months	£351	£351½	£345½	£346
Settlement		£358		£354
Week's turnover	6,875 tons		7,125 tons	
Tin				
Cash	£749½	£750	£756	£757
Three months	£746½	£747	£747½	£748
Settlement		£750		£757
Week's turnover	720 tons		635 tons	
Lead				
Current half month	£107	£107½	£106½	£107
Three months	£106½	£106½	£106½	£106½
Week's turnover	2,250 tons		2,775 tons	
Zinc				
Current half month	£90½	£91	£90½	£90½
Three months	£90½	£90½	£90½	£90½
Week's turnover	3,150 tons		1,820 tons	

OTHER LONDON PRICES — OCTOBER 13

METALS

Aluminium, 99.5%, £171 per ton	Nickel, 99.5% (home trade) £519 per ton
Antimony—	Osmium, £24/27 oz. nom.
English (99%) delivered, 10 cwt. and over £210 per ton	Osmiridium, £40 oz. nom.
Crude (70%) £200 per ton	Palladium, £7 10s./£8 0s. oz.
Ore (60% basis) 23s. 6d./24s. 6d. nom. per unit, c.i.f.	Platinum U.K. and Empire Refined £29 oz. Imported £35 0s. oz.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Rhodium, £40
Cadmium 11s. 6d. lb.	Ruthenium, £17 oz.
Chromium, 6s. 11d. lb.	Quicksilver, £91/£100 ex-warehouse
Cobalt, 21s. lb.	Selenium, 72s. nom. per lb.
Gold, 250s. 7½d.	Silver, 80½d. f.oz. spot and 79½d. f'd
Iridium, £30 oz. nom.	Tellurium, 16s. lb.
Manganese Metal (96%-98%) £269 according to quantity	
Magnesium, 2s. 4d. lb.	

ORES, ALLOYS, ETC.

Bismuth	50% 7s. 3d. c.i.f.
	40% 6s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semi-friable) 48% ..	£13 per ton c.i.f.
Refractory 45% ..	£13 per ton c.i.f.
Smalls 42% ..	£10 2s. 6d. per ton c.i.f.
Magnesite, ground calcined ..	£26-£27 d/d
Magnesite, Raw ..	£10-£11 d/d
Molybdenite (85% basis) ..	105s. 0d.-108s. 0d. per unit c.i.f.
Wolfram and Scheelite (65%) ..	271s./275s. c.i.f.
Tungsten Metal Powder (98% Min. W.) ..	21s. 7d. nom. per lb. (home)
Ferro-tungsten (80%-85%) ..	18s. 7d. nom. per lb. (home)
Carbide, 4-cwt. lots ..	£39 3s. 9d. d/d per ton
Ferro-manganese, home ..	£54 10s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) basis 100s. freight ..	84d. per unit c.i.f.
Manganese Ore (38%-40%) ..	69d. per unit
Brass Wire ..	3s. 3½d. per lb. basis
Brass Tubes, solid drawn ..	2s. 8½d. per lb. basis

(By Our Stock Exchange Correspondent)

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COMPANY NEWS AND VIEWS

Uncertain Share Markets

For more than three weeks both Wall Street and London markets have had to face a flow of news, the adverse implication of which has severely shaken investors' confidence in the near term future. Reflecting these fears, the Dow Jones Industrial Index has fallen from its all time peak of around 487 to 446 while that of *The Financial Times* has lost 6 points to its present level of 185.

Although severe fluctuations in security prices have always been a common American experience, a 40 point Wall Street setback in so short a time must be rated as a significant movement. Nevertheless, as it would appear to be due to fears arising mainly from President Eisenhower's illness, the fall seems to have been somewhat overdone. Indeed, the only concrete fact so far which might be regarded as unfavourable has been a statement by the U.S. Commerce Department that "the rate of current business advance has been less than earlier in the recovery period."

The position in London is substantially different, and although—as is usually the case—the Wall Street fall has dragged prices down in sympathy, recent indications have sufficed to make even the most optimistic investor a little doubtful about the future. Foremost amongst these has been the decline in average rate of industrial production growth during July and August. The rate for these months was only 4.1 per cent higher than that of last year as against a gain of 5.8 per cent in the first half of 1955. This fact, coupled with Mr. Butler's plea for dividend restraint and his impending new anti-inflationary measures due to be announced when Parliament re-opens in three weeks' time, has demolished—if only temporarily—the ultra optimistic economic arguments so frequently voiced only a few months ago. Investors have, in consequence, turned towards gilt-edged stocks—to the detriment of almost every other section—in the belief that future deflationary measures will not include further Bank Rate increases. This view would, in fact, appear to have some justification seeing that credit stringency has at last begun to show benefits.

In the period of uncertainty which has so quickly sprung up, short of moving into cash, it is not easy to know how best to keep funds employed. In this situation considerable opportunity appears to exist among South African gold shares at their present depressed levels. While this section remains the traditional hedge against industrial recession, it has always yielded a useful and uncommonly stable return on invested funds. But this is not the only attraction, for the development of the new Orange Free State field is at a most interesting, and on the whole encouraging stage. Nevertheless, the three O.F.S. issues: President Brand, President Steyn, and Western Holdings, all of which recently paid maiden dividends, have lately suffered severe declines. In the case of President Brand, the past few weeks have witnessed a fall from 74s. 7d. to 67s. 6d., President Steyn from 38s. 9d. to 33s. 6d., and Western Holdings from 88s. 9d. to 78s. 4d. Prices remained, however, very little affected by the announcement of the Anglo American quarterlies, suggesting that recent rumours had already fully discounted any disappointment at the results. Thus at present prices, a purchase of any one of these shares, while providing a revenue earning investment with good growth prospects, should also insure against a slide in industrial prices.

First Rand and O.F.S. Quarterly Results

In the absence of any sensational development values from the Anglo American September quarterlies, the most interesting feature of the reports concerned new ore reserve figures for the five O.F.S. properties which recently changed their financial year end to September 30.

On the whole the new estimates resulted in useful tonnage gains in the ore reserve positions of these mines. At Western Holdings an addition of 716,300 tons was made bringing total ore available up to 2,273,000 tons. The value, however, declined slightly by 0.68 dwt. to 10.81 dwt. per ton. A more noticeable decline in value took place at President Brand and the overall gold content lost 3.17 dwt. to 18.15 dwt. On the other hand, tonnage increased sharply by 667,900 tons to 1,573,000 tons. President Steyn also put on 743,500 tons bringing total reserves up to 2,524,500 tons. Values moved up by 0.18 dwt. to 8.49 dwt. Welkom's increase, amounting to 460,000 tons, raised tonnage available to 2,355,000 tons. Values also moved up fractionally by 0.04 dwt. to 5.93 dwt. In the case of Loraine—whose adverse statement regarding sampling errors recently caused great disappointment—it was particularly encouraging that tonnages should have increased by 8,000 tons

to 509,000 tons together with an advance in value by 0.05 dwt. to 4.05 dwt. per ton.

Once again, eagerly awaited high values from the Free State Geduld's No. 2 shaft area did not eventuate. It was, however, stated that the drive from Western Holdings gave 100 per cent payability from 260 ft. of Basal reef development with values of 1,864 in. dwt. This compares with 1,773 in. dwt. from 265 ft. in the preceding quarter.

Amongst the quarterly reports from Union Corporation, that from St. Helena must be rated as disappointing. Values obtained at this mine at 339 in. dwt. showed a substantial decline from the yearly average so far of around 410 in. dwt. On the other hand, Grootvlei reported the high average value of 107.6 dwt. per ton from development on the Kimberley reef. In. dwt. amounted to 538 as against 420 obtained during the previous quarter.

Bird Reef Development at Luipaards Vlei

As production of uranium from the Bird Reef at Luipaards Vlei Estate and Gold Mining Company started only in January, 1955, references as to how operations in this sphere have progressed constitute a particularly interesting item in the report and accounts in respect of the year ended June 30, 1955. Although the chairman's speech is not yet available, a report from the company's technical advisers states that the build up of ore reserves and stope faces on the Bird Reef series has not, as yet, been sufficient for the milling rate previously envisaged to be reached. With the object of enabling the uranium plant to operate at capacity, development work will, therefore, continue as rapidly as possible.

Anglo Rand's Bethal Holdings

An interesting aspect of the full report and accounts for Anglo-Rand Mining and Finance Corporation in respect of the year ended June 30, 1955, concerns the company's participation rights and interests in the Bethal and adjoining districts of the Far Eastern Rand. These holdings are described as "non-contributory interests in terms of certain agreements with Union Corporation whereby Anglo-Rand is entitled to various net percentages in the vendor interest and or subscription rights which may accrue as a result of turning to account certain options and prospecting contracts and mineral rights held by the Union Corporation over farms aggregating approximately 41,491 morgen".

As the report states, however, the major part of Anglo-Rand's stake in the Bethal area is at the moment pledged as security for a loan of £80,000 advanced by the Anglo American Corporation.

During the past financial year the Corporation made a loss of £1,734 as compared with that of £68,059 in the previous year. The accumulated debit balance carried forward was accordingly increased to £223,415 from £221,681.

The company's principal quoted shareholdings are in Beatrice Gold Mining, the Northern Transvaal (Messina) Copper Exploration Company and Union Tin Mines. These holdings, valued on the balance sheet as at June 30, 1955, at £152,605 had a market valuation at that date of £152,756. The Corporation also holds 73 shares out of the capital of 300 in 10s. units in the Vellefontein Tin Mining Company which is classed as its subsidiary. This interest appeared on the balance sheet at a value of £125,097.

Lieut.-Col. R. L. Broad is chairman. Meeting Johannesburg, October 27.

Trinidad Petroleum Expansion

The report and accounts of Trinidad Petroleum Development Company in respect of the year ended July 31, 1955, disclose an expansion of total assets to £4,352,899 from £4,156,923. Mainly responsible for this increase was a rise to £905,464 from £876,556 in oil wells and development account, together with a larger total of current assets at £1,835,492 as against £1,670,537. Net liquidity totalled some £900,000. Cash in hand or at bankers fell to £224,334 from £524,709 but this was more than made up by newly acquired treasury bills, which, at cost, represented £619,011 (nil). Tax reserve certificates were down at £119,150 from £301,250.

During the past financial year total output of crude oil advanced to 3,434,239 barrels from 3,319,941 barrels. Sales amounted to 3,406,059. This brought in the higher total revenue of £2,024,386 as compared with £1,921,311. After a transfer to general reserve of £150,000 (£75,000) and provision for

dividends, which absorbed £251,439 (£221,175), the balance carried forward declined to £196,950 from £202,515.

At their present price of around 26s., Trinidad Petroleum 5s. ordinary shares give a return of over 7½ per cent. General Sir Leslie C. Hollis is chairman. Meeting November 17, London.

Higher Dividends from Copper

The outstanding strength of copper prices over recent months has been tangibly reflected in higher dividend payments from R.S.T. Group companies and Tanganyika Concessions, details of which appear in the table below.

FINAL DIVIDENDS AND PRELIMINARY FIGURES

Name of Company	Year ended	Final Dividend %	Net Profit After Tax		Total Dividends	
			This Year	Last Year	This Year	Last Year
			£(000)	£(000)	%	%
Gold Fields Rhod. (a)	31.5.55	5	24.2	45.1	5	5
Southern Kinta (b)	31.3.55	50	602.3	556.0	82½	70
African Invest. Tst.	30.6.55	5	19.4	12.8	5	5
London & Rhod.	30.6.55	6½	61.0	65.3	10	7½
Tanganyika Concs.	31.7.55	55	3000.8	2519.3	70	55
Rhod. Sel. Tst. (c)	30.6.55	65	3452.5	2417.7	95	70
Mufulira (d)	30.6.55	70	6393.9	4870.9	100	75
Roan Antelope (e)	30.6.55	55	5922.7	4728.6	80	70
Perak Riv. Hydro (f)	31.7.55	10	660.2	233.6	10	10

- (a) Excluding taxation recoverable £20,427 (1954—£19,944).
 (b) Dividends amounting to 32½ per cent paid on 5s. shares before return of capital. Final of 50 per cent paid on 4s. shares. (1954—dividends totalling 70 per cent paid on 5s. shares before return of capital.)
 (c) 1954/55 dividends on £5,654,790 capital subject to Rhodesian and Nyasaland tax at 7s. 6d. in the £. 1953/54 dividends equivalent to 70 per cent on £5,293,846 capital before 3 for 44 rights issue.
 (d) 1954/55 dividends on £8,814,790 capital subject to Rhodesian and Nyasaland tax at 7s. 6d. in the £. 1953/54 dividend equivalent to 75 per cent on £8,148,123 capital. In addition special interim of 4s. 3-545d. per share free of tax was paid.
 (e) 1954/55 dividends on £8,987,688 capital subject to Rhodesian and Nyasaland tax at 7s. 6d. in the £.
 (f) 1954/55 profit struck after Cr. £250,000 from taxation and Dr. £250,000 depreciation. 1953-54 Dr. £250,000 depreciation only.

Apart from higher dividends received by way of its holding in Union Minière, the large Belgian Congo copper producer, Tanganyika Concessions owes part of its higher profits to receipts from Benguela Railway, in which it holds 90 per cent of the equity. Firstly, this company, after many years operations, recently paid a maiden dividend of 10 per cent. Secondly, liquidation of the railway's 4 per cent debentures provided "Tanks" with an unexpected receipt of £579,302 by way of interest arrears. But neither this amount (on which tax of £279,511 must be paid) nor a £168,700 profit on redemption of these debentures has been included in the net profit figures shown in the table.

Amalgamated Tin Produces Less Columbite

During the year ended March 31, 1955, columbite output by Amalgamated Tin Mines of Nigeria was reduced by 102 tons from 717 tons during the previous year. This was due to a fall of 143 tons in production from the treatment of mill tailings. There was, however, a higher yield from tributaries and contractors amounting to 41 tons. The company's output of tin concentrates was little changed and the total of 4,094 tons showed the slight gain of 4 tons over the previous year.

A feature of the parent company's balance sheet (in which the figures for the two wholly owned subsidiaries, Keffi Tin and London Nigerian Mines are not consolidated) was the higher provision for depreciation during the past financial year. This rose to £2,594,106 from £2,108,259 previously and the book value of fixed assets accordingly declined to £425,000 against an original valualational cost of £2,994,106. There was little change in the strong financial position, and net liquid assets comprised over £2,000,000. Of this amount cash on deposit or at bankers amounted to some £1,060,000 and tax reserve certificates to £130,000.

As previously announced in the preliminary report, Amalgamated Tin profit for the year before taxation rose to £1,480,069 from £1,462,506. Included in this figure was a maiden dividend from Keffi Tin Company which amounted to a gross sum of £77,061. After taxation of £768,000 (£926,000), and dividends of 45 per cent (44 per cent) which absorbed

£494,812 as against £471,900 the unappropriated balance was £274,459 (£267,202).

Unlike last year the statement of the chairman, Mr. J. Ivan Spens will not be available until the date of the company's meeting in London on October 21. Meanwhile returns for six months of the current financial year show that 2,179 tons of tin concentrates have been produced as compared with 1,991 tons during the previous corresponding period. Columbite output was 307 tons as against 283 tons.

Tekka's Outlay for Mining Lease Renewal

The maintenance of the level of tin production, albeit from higher grade ground, coupled with the better price received for tin during the year ended March 31, 1955, would normally have meant somewhat larger profits for Tekka, the Malayan tin producer. Unfortunately, however, due to the necessity of including in mining expenditure an exceptional item of over £7,000 in respect of premiums on the renewal of mining leases, this did not eventuate.

Year to Mar. 31	Ground Treated (cu. yds.)	Tin Ore Output (tons)	Per Cubic Yard Yield lbs.	Yard Cost d.	Price Per Ton £ s. d.
1955	376,500	149.1	0.89	28.1	424 13 5
1954	506,400	149.4	0.67	16.6	380 5 7

Dividends on the company's issued ordinary capital of £358,577 in shares of £1 were maintained at 5 per cent.

Year to Mar. 31	Total Revenue £	Taxation £	Net* Profit £	Dividends £	To Reserve £	Carry Forward £
1955	88,276	18,387	10,510	10,197	4,218	28,619
1954	77,269	16,142	11,700	9,861	Nil	28,321

* After total Malayan expenditure of £56,391 (1954 - £46,611).

In his statement to shareholders, Mr. D. W. Thomas, the chairman, said that during the first five months of the current financial year output had totalled 56½ tons of tin ore. It was expected, he said, that the year's production would be maintained at a level comparable with that of the previous twelve months. This would, indeed, appear to be likely for returns from the company in respect of the first six months to September 30 show that 66½ tons of tin ore have been produced as against 68½ during the previous corresponding period.

At their present price of around 6s. Tekka ordinary £1 shares show a yield of 16 per cent. Meeting, Redruth, Cornwall, October 26.

Company Shorts

British Petroleum Gets £10,000,000 Tax Credit.—It has been announced by the British Petroleum Company that its claim for U.K. tax relief has been settled. There will accordingly be a net increase in the group's tax-paid profits of approximately £10,000,000 in the 1954 accounts.

Dates of Harmony and Blyvoor Meetings.—Notice has been given by the Central Mining-Rand Mines Group that the meeting of Harmony Gold Mining Company will be held at Johannesburg on Monday, November 14, at 10 a.m. The company's transfer books will be closed from November 8 to 14 inclusive. Blyvooruitzicht Gold Mining Company will hold its meeting on Tuesday, November 15, at 11 a.m. This company's transfer books will close from November 9 to 15 inclusive.

At each of the above meetings members will be asked to pass a special resolution to dispense with placing before future meetings the return specifying contracts referred to in sub-section (9) of section 70 quin. of the Companies Act, 1926, as amended, of the Union of South Africa. In addition, Harmony Gold will ask members to consider a special resolution amending its articles of association.

Siamese Tin Announces Terms for New Acquisitions.—Sterling offers (which will be made in Malayan and Australian equivalents) have been announced by Siamese Tin Syndicate for the acquisition of three companies which they have recently been investigating. The prices concerned are as follows: Renong Consolidated Tin Dredging, 35s.; Katu Tin Dredgings, 44s.; and Burma-Malay Tin, 24s. The offers will be made conditional upon acceptance by 90 per cent of shareholders or such less proportion as Siamese Tin may be prepared to accept.

Great Western Consolidated N.L. has announced that in consideration of the amounts made available on loan over the past two years by Western Mining Corporation, it has cancelled the previous share option and has granted Western Mining Corporation a further option to subscribe for up to 750,000 shares at a discount of A4s. per share over the five year period ending September 30, 1960.

KRAMAT PULAI, LTD.**MR. ERNEST V. PEARCE'S STATEMENT**

The forty-seventh annual general meeting of Kramat Pulai, Ltd., was held on October 10 at 73 Cheapside, London, E.C., Mr. Ernest V. Pearce, A.M.I.M., chairman of the company, presiding.

The following are extracts from the chairman's statement circulated with the report and accounts:—

The working profit for the year ended March 31, 1955, £16,733, exceeds that of the previous year by £5,731. This increase is, however, more than offset by an increase of £2,083 in our Taxation liability and by the cost, £3,385, incurred in prospecting off the coast of Malacca. After making provision for these two items the net profit is £4,608, a decrease of £885 from that of the year which ended on March 31, 1954.

Your Directors recommend that a dividend of 3d. per share, and a bonus of 3d. per share, both less Income Tax at 8s. 6d. in the £, be declared.

Since the Accounts were issued the Directors have further considered the Company's finances and have decided to distribute to Shareholders a special dividend of 2s. per share, less Income Tax, out of the accumulated balance of Profit and Loss Account. After deducting Income Tax at 8s. 6d. in the £ it will require £23,000 to pay this special dividend. In addition there will be payable a Profits Tax Distribution Charge of approximately £7,000.

Tin Concentrates produced amounted to 225.3 tons, an increase of 54.14 tons on the previous year's figure.

Scheelite production amounted to 33.95 tons, which realized an average price of £725 per ton—some £75 per ton less than that realized in the previous year. The highest price realized per ton was £953 14s. for material which assayed 75.58 per cent. Tungsten Oxide and the lowest £548 11s. for material which assayed 72.18 per cent. These figures furnish a good illustration of the fluctuations in the market for Scheelite. At the time of writing the price for high-grade material such as we produce is about £950 per ton.

It is satisfactory to note from this that bandit activity in the Pulau Valley—a notoriously troublesome spot—was on a reduced scale and we join in the Manager's appreciation of the services rendered by the Military and Police Forces.

KAMPONG BINJAI

Again I regret to say that we still await the grant of a Mining Lease to cover the Kampong Binjai area. It is now practically three years since we lodged an application for the Lease. Negotiations have been carried on continuously but at every turn some new obstacle seems to crop up. The attitude of the Authorities in this matter is, to say the least of it, astonishing and incomprehensible for Government has been advised that if a Mining Lease is granted our Associate Company, Malayan Tin Dredging, Ltd., whose Kampong Gajah property adjoins Kampong Binjai, is prepared to instal a large dredge which would eventually operate in the area. Kampong Binjai is a low-grade property and it is generally recognized that the future of the Malayan Tin Industry will depend on the successful exploitation of low-grade deposits. Moreover this particular property is unlikely to be of use for any other purpose until it has been dredged.

Unless the Departments responsible for dealing with Mining Lease Applications are prepared to consider them expeditiously and sympathetically and to avoid the imposition of onerous and unnecessary conditions whenever possible the outlook for the industry cannot be said to be encouraging. It is particularly unfortunate that avoidable difficulties should be created at a time when the importance of Tin to the economy and future welfare of Malaya and its people is so apparent.

The Report and Accounts were adopted.

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Mining Matters

Dr. E. C. Bain, Vice-President, Research and Technology, United States Steel Corporation, will deliver the Eighth Hatfield Memorial Lecture on *Trends in Metallurgical Research in the United States*, at 6.30 p.m. on Monday, October 17, 1955, in the Firth Hall of Sheffield University.

The Second General Meeting of members and associates of The Cornish Institute of Engineers will be held at The School of Mines, Camborne, on Thursday, October 20, 1955, at 7.15 p.m., when a Paper entitled *The Stannaries, Blowing Houses and Coinage Halls* will be read by Mr. G. E. P. Roberts, A.C.S.M., M.I.M.E.

Head, Wrightson and Co. Ltd. announce the formation of The Head Wrightson Export Co. Ltd. to extend their interests in markets overseas. Mr. Vaughan Pendered has been appointed managing director, with London headquarters at 20 Buckingham Gate, S.W.1.

The Institution of Mining and Metallurgy will hold the First Ordinary General Meeting for the Session 1955-56 in the Apartments of the Geological Society, Burlington House, Piccadilly, London, W.1, on Thursday, October 20, 1955, at 5 p.m. The following papers will be submitted for discussion: *Research As A Business Enterprise*, by F. H. Chapman, consulting metallurgist, Anglo American Corporation of South Africa Ltd., and *Pressure Manifestations At Great Mining Depths on the Witwatersrand*, by J. F. G. R. Heywood, general manager, Crown Mines Ltd.

New Gold Fields Appointments have recently been announced affecting Consolidated Gold Fields of South Africa and its wholly-owned subsidiary, New Consolidated Gold Fields. Mr. R. H. A. Neuschild and Mr. A. R. O. Williams have joined the Boards of both companies. Mr. Neuschild was previously manager of these companies while Mr. Williams has served as the Group's resident engineer for a number of years. Mr. F. N. Keith and Mr. J. D. McCall who were previously assistant managers, have now been appointed managers of both companies while Mr. J. B. Simpson, A.C.S.M., M.I.M.E., M.I.M.E., now becomes resident engineer.

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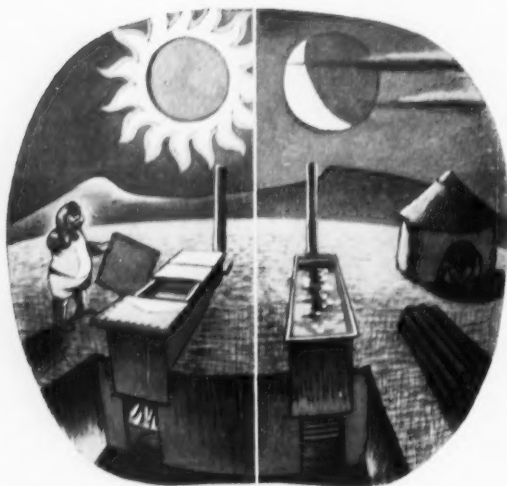
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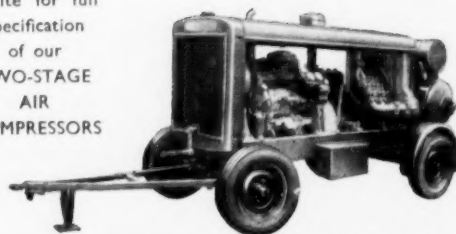
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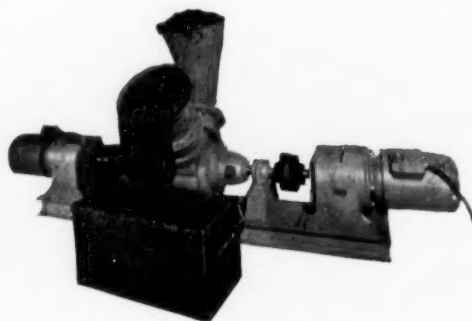
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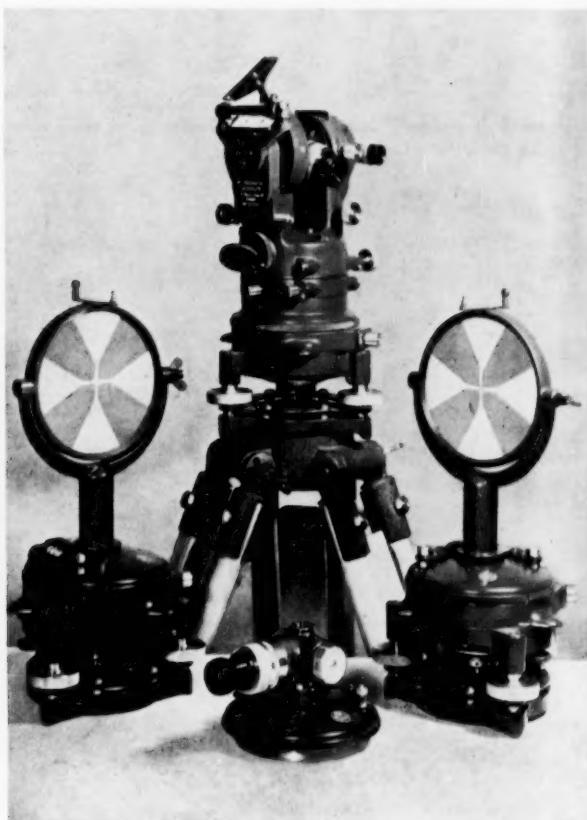


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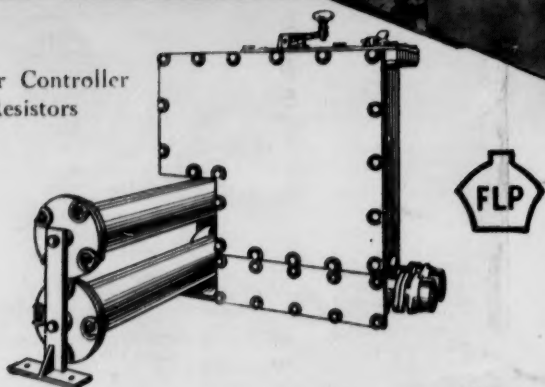
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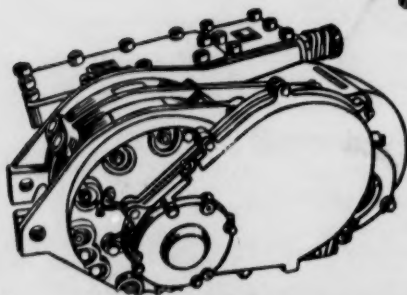
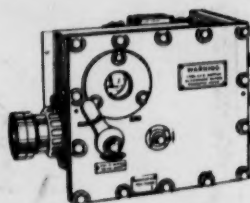
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Cementation Co. Ltd.
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Sheepbridge Eng'g Ltd.
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Sheepbridge Eng'g Ltd.
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- DREDGES**
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Smit (J. K.) & Sons Ltd.
Triefus Ltd.
Van Moppes (L. M.) & Sons Ltd.
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Wood (Hugh) & Co. Ltd.
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Craelius Co. Ltd.
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Igran Electric Co. Ltd.
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Siemens-Schuckert (G.B.) Ltd.
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Igran Electric Co. Ltd.
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Siemens-Schuckert (G.B.) Ltd.
Wood (Hugh) & Co. Ltd.
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Premier Plant & Hire Co. Ltd.
Ransomes & Rapier Ltd.
Ruston Bucyrus Ltd.
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- FILTERS**
Denver Equipment Co. Ltd.
- FILTERS — LUBRICATING OILS**
Stream-Line Filters Ltd.
Tecalmit Ltd.
- FILTERS — SWITCH & TRANSFORMER OIL**
Stream-Line Filters Ltd.
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Nu-Swift Ltd.
Pyrene Co. Ltd.
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Cuxon Gerrard & Co. Ltd.
- FLEXIBLE JOINTS**
The Unicone Co. Ltd.
- FLOTATION EQUIPMENT**
Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Huntington, Heberlein & Co. Ltd.
Knapp & Bates Ltd.
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Cementation Co. Ltd.
- FURNACES**
Birlec Ltd.
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Hilger & Watts Ltd.
- GEOPHYSICAL & GEOLOGICAL SURVEYS**
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Moxey Conveyor & Transporter Co. Ltd.
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Siebe Gorman & Co. Ltd.
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Holman Bros. Ltd.
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Dunlop Rubber Co. Ltd.
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English Electric Co. Ltd.
General Electric Co. Ltd.
Igran Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.
Victor Products (Wallsend) Ltd.
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Ruston & Hornsby Ltd.
Wood (Hugh) & Co. Ltd.
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Metropolitan-Vickers Electrical Co. Ltd.
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Tecalmit Ltd.
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- MAGNETS-ELECTRO LIFTING**
Igran Electric Co. Ltd.
Rapid Magnetic Machines Ltd.
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Dollery & Palmer Ltd.
Holman Bros. Ltd.
Wood (Hugh) & Co. Ltd.
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British Geon Ltd.
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- Holman Bros. Ltd.**
Ward (Thos. W.) Ltd.
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Fraser & Chalmers Eng'g Wks.
Ward (Thos. W.) Ltd.
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Denver Equipment Co. Ltd.
Ruston Bucyrus Ltd.
- PUMPS — SAND**
Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.
- PUMPS — SINKING**
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Ward (Thos. W.) Ltd.
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British Tyre & Rubber Co. Ltd.
Dunlop Rubber Co. Ltd.
- SAFETY EQUIPMENT**
Safety Products Ltd.
Siebe Gorman & Co. Ltd.
- SCRAPER HAULAGE**
Austin Hopkinson & Co. Ltd.
Holman Bros. Ltd.
Wood (Hugh) & Co. Ltd.
- SCRAPER LOADERS**
Atlas Diesel Co. Ltd.
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Joy-Sullivan Ltd.
- SCREENING PLANT**
Allis Chalmers (Gt. Britain) Ltd.
Davies Magnet Wks. Ltd.
Fraser & Chalmers Eng'g Wks.
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- TUBE MILL LINERS**
Hadfields Ltd.
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Aerex Ltd.
- VEE-ROPE DRIVES**
Wigglesworth (F.) & Co. Ltd.
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Cementation Co. Ltd.
- WELDING ELECTRODES**
Metropolitan-Vickers Electrical Co. Ltd.
- WELDING EQUIPMENT**
British Insulated Callender's Cables Ltd.
English Electric Co. Ltd.
Lincoln Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.
Siemens-Schuckert (G.B.) Ltd.
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British Ropes Ltd.
- WINDING EQUIPMENT — ELECTRIC**
British Thomson-Houston Co. Ltd.
English Electric Co. Ltd.
General Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.



Master Controller
and Resistors



Battery
Switch
Box



Motor with gears

The British made
"ATLAS" 7 ton Battery
Mining Locomotive
manufactured by Wm.
Neill & Son (St. Helens)
Ltd. fitted with flame-
proof electrical equip-
ment built by

METROPOLITAN-VICKERS

ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER 17

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